Delopment and Validation of a Self-Efficacy Scale for Distance Learning

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A B S T R A K

Tidak semua siswa dan mahasiswa siap dalam menghadapi perubahan terutama terkait dengan efikasi diri dalam konteks pembelajaran yang sepenuhnya berbasis teknologi. Penelitian ini bertujuan untuk mengembangkan dan memvalidasi Skala Efikasi Diri untuk Pembelajaran Jarak Jauh/SESDL yang dapat diandalkan dan valid. Skala ini dirancang untuk mengukur efikasi diri pada mahasiswa yang belajar dalam konteks pembelajaran jarak jauh. Penelitian ini melibatkan 151 mahasiswa UPBJJ-UT Denpasar yang dipilih menggunakan Cluster Sampling. Instrumen yang dikembangkan terdiri dari 34 item pernyataan yang mencakup tiga dimensi efikasi diri, yaitu magnitude, strength, dan generality. Validasi instrumen dilakukan melalui analisis faktor konfirmatori (CFA) dan model Rasch. Hasil analisis menunjukkan bahwa instrumen SESDL memiliki reliabilitas yang tinggi, validitas konstruk yang kuat, dan kesesuaian model yang baik. Skala ini dapat digunakan oleh para pendidik, peneliti, dan praktisi untuk mengukur efikasi diri mahasiswa pada pembelajaran jarak jauh secara akurat. Implikasi penelitian ini adalah memiliki dampak signifikan bagi berbagai pihak dalam dunia pendidikan. Bagi pendidik dan lembaga pendidikan, skala ini dapat digunakan sebagai alat evaluasi untuk memahami tingkat efikasi diri siswa dalam konteks pembelajaran jarak jauh. Dengan pemahaman ini, pendidik dapat merancang strategi dan metode yang lebih tepat sasaran guna meningkatkan keyakinan diri siswa dalam mengatasi tantangan PJJ, seperti meningkatkan keterampilan manajemen waktu, kemandirian belajar, dan penggunaan teknologi.

A B S T R A C T

Not all students are ready to face changes, primarily related to self-efficacy in the context of entirely technology-based learning. This study aims to develop and validate a reliable and valid Self-Efficacy Scale for Distance Learning/SESDL. This scale is designed to measure self-efficacy in students studying in the context of distance learning. This study involved 151 UPBJJ-UT Denpasar students selected using Cluster Sampling. The instrument developed consisted of 34 statement items covering three dimensions of self-efficacy, namely magnitude, strength, and generality. Validation was done through confirmatory factor analysis (CFA) and the Rasch model. The analysis showed that the SESDL instrument had high reliability, strong construct validity, and good model fit. Educators, researchers, and practitioners can use this scale to accurately measure student self-efficacy in distance learning. The implications of this study are that it significantly impacts various parties in the world of education. For educators and educational institutions, this scale can be used as an evaluation tool to understand student self-efficacy in the context of distance learning. With this understanding, educators can design more targeted strategies and methods to increase students' self-confidence in overcoming the challenges of distance learning, such as improving time management skills, learning independence, and using technology.

1. INTRODUCTION

Self-efficacy, a concept rooted in psychology, refers to an individual's belief in their ability to control various aspects of life to achieve desired outcomes. These beliefs extend to a person's influences, behavior, motivation, and social environment, influencing the goals set and the performance achieved by the individual (Hungnes et al., 2022; Kim et al., 2024). In the context of distance learning, self-efficacy

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includes an individual's realistic awareness of his or her cognitive, emotional, and social abilities, problem-solving skills, preferred thinking style, self-confidence, and ability to handle various activities in the online learning environment. In addition, self-efficacy plays an important role in classroom management, influencing individuals' willingness to take certain actions and their persistence in facing challenges encountered during learning. execution of that action (AlAli & Saleh, 2022; Slater & Main, 2022). In the field of education, self-efficacy has been studied extensively, and researchers are exploring its implications for teachers, students, and educational outcomes (Bjerke & Eriksen, 2016; Bjerke & Xenofontos, 2019; Hungnes et al., 2022; Pampaka et al., 2023; Watt et al., 2019). For example, research has investigated teacher self-efficacy in teaching mathematics, the impact of self-efficacy on student academic performance, and the development of self-efficacy measures for educators in various fields (Bjerke & Eriksen, 2016; Bjerke & Xenofontos, 2019). Additionally, the validation and reliability of self-efficacy instruments have been assessed using advanced statistical techniques such as Rasch analysis, to ensure the robustness of these measurements (Pampaka et al., 2023; Phipps, 2023).

The self-efficacy of students in distance learning at universities plays an important role in improving academic success. This is because self-efficacy is closely related to students' ability to organize the actions necessary to achieve their academic targets. In distance learning, high self-efficacy allows students to develop important independent learning skills, facilitating effective management of their learning process. (Hidayati & Siswati, 2023; Santoso et al., 2022). Apart from that, self-efficacy also influences students' learning outcomes and academic achievements, because they tend to set realistic goals, apply effective learning strategies, and show positive motivation and emotions. In facing distance learning challenges such as isolation and lack of direct support, high self-efficacy plays an important role in maintaining student engagement and motivation (Slater & Main, 2022; Zheng, 2020). In addition, self-efficacy contributes to students' emotional well-being and resilience in facing challenges, reduces anxiety, and improves overall mental health. Thus, self-efficacy becomes an important supporting factor for academic success, independent learning skills, emotional well-being, as well as student involvement and motivation in distance learning at universities. Self-efficacy not only influences a person's actions, choices and efforts but also plays an important role in building resilience to overcome obstacles and failures in life (Yi et al., 2020; Yuberti et al., 2021). Self-efficacy mediates performance in various areas by influencing activity selection, goal setting, strategy choice, persistence in completing tasks, and seeking help when needed. The development of self-efficacy measures has become a focal point in educational research, with research focusing on different domains such as language learning, science education, mental health, and career decision making (Hu et al., 2021; Pruski et al., 2022; Smith, 2020). These measures aim to provide insight into individuals' perceived abilities and how these beliefs influence their behavior and achievements in a particular context.

Previous research has shown that the development of valid and reliable self-efficacy instruments involves a variety of psychometric approaches, both traditional and modern, such as exploratory factor analysis (EFA), Cronbach's Alpha, Rasch analysis, and confirmatory factor analysis (CFA), to ensure internal consistency. , construct validity, and unidimensionality (Pudritz et al., 2020; Kudusheva et al., 2021). Refinement of items based on item fit analysis is also a common practice to improve item clarity and relevance (Vasseleu et al., 2021; Kudusheva et al., 2021). Rasch analysis is often used to examine item responses and measure self-efficacy levels comprehensively. In addition, self-efficacy validation instruments usually include assessments of various aspects of validity, such as face validity, content validity, construct validity, and predictive validity, to ensure the effectiveness of measuring the self-ability construct. Among various developmental studies, only one article was found by researchers who developed a self-efficacy instrument for distance learning, viewing. The aspects used in developing self-efficacy instruments are knowledge and learning experience, communication and interaction, feedback, social impact, student motivation, and attitudes (Bhattacharya et al., 2021; Chen et al., 2020). Meanwhile, in this research, we utilized aspects of self-efficacy, namely Magnitude, Strength, and Generality (Croy et al., 2021; Dang & Chou, 2020).

The novelty in this research lies in the development of a self-efficacy scale specifically designed for the distance learning context, which has not been widely explored in previous studies. Most of the existing self-efficacy instruments still focus on conventional learning in face-to-face classes, so they are less relevant in measuring students' self-confidence in facing the unique challenges and demands of distance learning, such as independent time management, independence in understanding material, and the use of technology to interact and complete tasks. Through the development and validation of this scale, this research provides a new contribution to the literature on self-efficacy in education by providing a valid and reliable instrument for measuring student self-efficacy in distance learning environments. This scale also offers a more comprehensive perspective on how self-efficacy may be influenced by factors specific to distance learning, which may ultimately serve as a basis for the development of learning strategies and educational policies

that are more responsive to the challenges of technology-based education. The aim of this research is to develop and validate a reliable and valid Self-Efficacy Scale for Distance Learning (SESDL) instrument for measuring the self-efficacy of students studying in a distance learning context. It is hoped that this research can contribute to the development of a valid and reliable instrument for measuring self-efficiency in the context of distance learning, which can be used to improve the quality of learning and support students in achieving academic success.

2. METHODS

This research uses a quantitative approach with a focus on analyzing self-efficacy instruments for distance learning. Validation of self-efficacy using the Rasch model. The Rasch model allows for the measurement of attributes or latent constructs on a meaningful interval scale, allowing for more precise and meaningful comparisons between individuals or items (Campos et al., 2020; Uzuntiryaki-Kondakci & Capa-Aydin, 2023). This model provides a strong foundation for developing more valid and reliable measurement instruments, as well as analyzing data in a more meaningful and interpretable way. The participants in this research were 151 UPBJJ-UT Denpasar students (the ratio of questions to participants was approximately 1:5). The distribution of participants is shown in Table 1. The sample was obtained through Cluster Sampling, where we targeted 150 students from various classes at UPBJJ- UT Denpasar. The distribution of participants is presented in Table 1.

Table 1. Distribution of Participants

Gender		20th year				Total
Man	Woman	1	2	3	4	
38	113	33	74	32	12	151

The data collection tool used in this research is a self-efficacy instrument which consists of three aspects: magnitude, strength, and general. The instrument developed was a questionnaire with a 1-5 Likert scale, consisting of 34 statement items. Table 2 presents a blueprint for a self-efficacy instrument for distance learning. The blueprint for the self-efficacy instrument is presented in Table 2.

Table 2. Blueprint for Self-Efficacy Instruments

Dimensions	Indicator	Positive	Negative
The size	Approach courses and assignments with an optimistic attitude	1	2
	Level of interest in courses and assignments	3	4
	Improve skills and achievements	5	6
	View challenging tasks as opportunities for growth	7	8
	Carry out learning according to the established schedule	9	10
	Setting priorities in achieving goals	11	12
	The efforts given can improve good learning achievement.	13	14
Strength	Dedication in completing the assigned task.	15	16
	Believe and realize the power you have.	17	18
	Diligence in completing tasks.	19	20
	Have positive goals in doing various things.	21	22
	Have strong self-motivation for self-development.	23	24
	Facing various situations well and thinking positively.	25	26
	Using past experiences as opportunities to achieve success.	27	28
Generality	Enjoy exploration in new situations.	29	30
	Able to handle all situations effectively.	31	32
	Try a new challenge.	33	34

The research was conducted in four main stages: research preparation, formulation of self-efficacy instruments, research implementation, and data analysis and report preparation. In the preparation stage, researchers design research and prepare supporting materials. Furthermore, the self-efficacy instrument is designed and evaluated by experts to ensure linguistic accuracy. The instrument was then implemented via Google Forms to facilitate student participation. Finally, the collected data is analyzed using the Rasch

model, and a research report is prepared based on the results of this analysis. Before carrying out Rasch analysis, the self-efficacy instrument measurement model was first tested using Confirmatory Factor Analysis (CFA) with the help of SMART PLS 4 software. This step aims to ensure the validity and reliability of the construct measured by the instrument before being further analyzed with the Rasch model using Winstep software. The Rasch model is based on two main assumptions: the individual's level of ability/agreeableness and the item's level of difficulty. Psychometric analysis includes summary statistics to evaluate respondent quality, instrument quality, and the interaction of the two. Apart from that, this analysis also produces item size (item difficulty level), item suitability, and unidimensional assessment to measure the instrument's ability to measure the intended construct.

3. RESULT AND DISCUSSION

Result

Acceptable loading factor values generally range from 0.5 to 1.0, with higher values show A stronger the relationship between indicators and their construction indicators (JF Hair et al., 2019). First result your CFA has been two items removed because loading factor the value is <0,5, namely M2 and G28. Result of analysis show that all General items (G25-G34) have very high loading factor (0.862-0.967), show a very good ability to measure the Generality construct. Most Item size (M1, M3-M10) also shows high factor loading (0.686-0.969), with item M4 own the lowest value but still acceptable. Power items (S11-S24) show wider inner variations load factor (0.606-0.842), with item S15 own lowest value but still meets the minimum criteria. CFA results showed in Figure 1. The model fit is presented in Table 3.
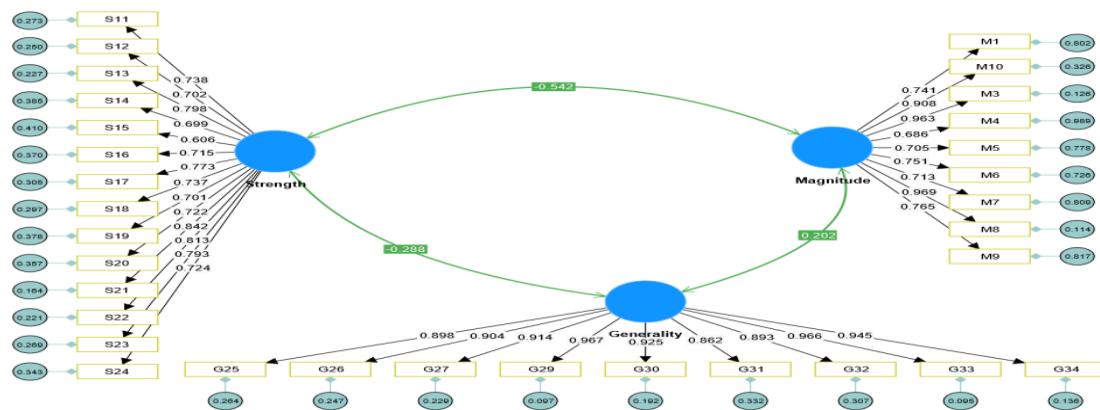
Figure 1. CFA Results

Table 3. Model Fit

	Model estimates	Model nol
Chi-square	903.842	5503.696
Number of model parameters	67	32
Number of observations	151	There isn't any
Degrees of freedom	461	496
P value	0	0
ChiSqr/df	1.961	11.096
RMSEA	0.08	0.259
RMSEA LOW 90% CI	0.072	0.252
HIGH RMSEA 90% CI	0.087	0.265
GFI	0.731	There isn't any
AGFI	0.692	There isn't any
PFI	0.638	There isn't any
SRMR	0.05	There isn't any
	Model estimates	**Model nol**
NFI	0.836	There isn't any
TLI	0.905	There isn't any
Finance	0.912	There isn't any
AIC	1037.842	There isn't any
BIC	1240	There isn't any

A Good CFA Model Fit has an RMSEA value of less than 0.08, SRMR less than 0.08, GFI and Financials greater than 0.9, and the chi-square value is not significant (JF Hair et al., 2019). The results of the Model Fit analysis in Table 2 show that the estimated model has a good fit to the data ($\chi2$ = 903.842, df = 461, p < 0.001; RMSEA = 0.08; SRMR = 0.05; CFI = 0.912; TLI = 0.905), when the null model did not fit (χ^2 = 5503.696, df = 496, p < .001; RMSEA = 0.259). Other fit indices (GFI, AGFI, PGFI) also showed moderate fit for the estimated model (JF Hair et al., 2019). These results indicate that the estimation model proposed by the researcher is better at explaining the relationships between variables compared to the null model. Reliability and validity are presented in Table 4.

Table 4. Establish Reliability and Validity

	Cronbach's alpha (standardized)	Cronbach's alpha (not standardized)	Composite reliability (rho_c)	Average variance extracted (AVE)
Generality	0.981	0.981	0.98	0.846
The size	0.946	0.946	0.944	0.651
Strength	0.944	0.944	0.944	0.551

A good reliability value is That Composite Reliability Values> 0,70 And Alfa Cronbach> 0.70, nor adequate convergent validity with AVE value> 0.50 (JF Hair dkk., 2019). That's reliability and validity analysis results in Table 3 show that research instrument own excellent internal consistency and reliability, with Cronbach's alpha value and composite reliability (rho_c). on 0.9 for all constructs (Generality, Magnitude, and Strength). Besides that, convergent validity as well from with average variance extracted (AVE) values exceeding 0.5 for all constructs, shows That most from goods differences could be explained by their respective constructions. Summary statistics are presented in Figure 2.

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      SUMMARY OF 151 MEASURED Person
------------------------------------------------------------------------
|          TOTAL                        MODEL        INFIT      OUTFIT   |
|          SCORE      COUNT    MEASURE   ERROR    MNSQ   ZSTD  MNSQ  ZSTD |
|----------------------------------------------------------------------|
| MEAN     115.9      32.0       .48      .18      .98   -.4  1.00   -.4 |
| S.D.      12.9       .0        .39      .02      .59    2.2   .66   2.1 |
| MAX.     142.0      32.0      1.51      .25     3.93    7.0  4.81   7.9 |
| MIN.      81.0      32.0      -.48      .16      .15   -6.2   .16  -5.8 |
|----------------------------------------------------------------------|
| REAL RMSE    .20 TRUE SD    .34  SEPARATION  1.70  Person RELIABILITY  .74 |
|MODEL RMSE    .18 TRUE SD    .35  SEPARATION  1.94  Person RELIABILITY  .79 |
| S.E. OF Person MEAN = .03                                             |
------------------------------------------------------------------------
Person RAW SCORE-TO-MEASURE CORRELATION = 1.00
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .80

      SUMMARY OF 32 MEASURED Item
------------------------------------------------------------------------
|          TOTAL                        MODEL        INFIT      OUTFIT   |
|          SCORE      COUNT    MEASURE   ERROR    MNSQ   ZSTD  MNSQ  ZSTD |
|----------------------------------------------------------------------|
| MEAN     546.9     151.0       .00      .08      .97   -.3  1.00    .0 |
| S.D.      88.2       .0        .55      .01      .14    1.3   .16   1.4 |
| MAX.     657.0     151.0       .85      .11     1.22    2.2  1.30   2.7 |
| MIN.     400.0     151.0      -.80      .07      .69   -3.1   .69  -3.0 |
|----------------------------------------------------------------------|
| REAL RMSE    .09 TRUE SD    .55  SEPARATION  6.33  Item   RELIABILITY  .98 |
|MODEL RMSE    .08 TRUE SD    .55  SEPARATION  6.47  Item   RELIABILITY  .98 |
| S.E. OF Item MEAN = .10                                               |
------------------------------------------------------------------------
UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -.99
4832 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 12428.63 with 4647 d.f. p=.0000
Global Root-Mean-Square Residual (excluding extreme scores): .9820
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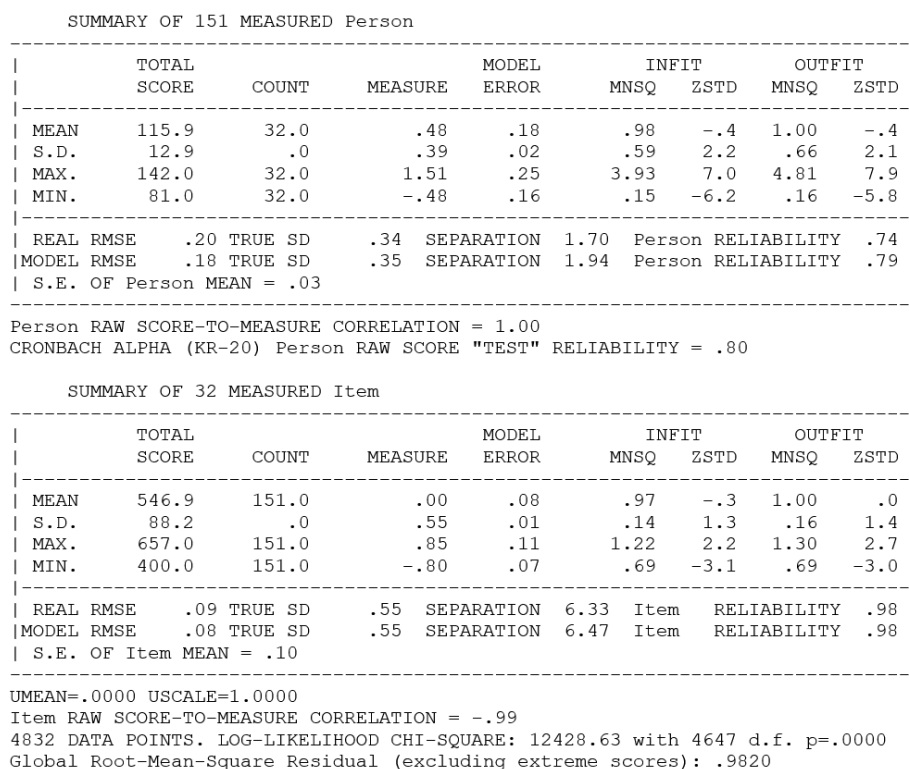
Figure 2. Summary Statistics

Other data in Figure 2 is INFIT MNSQ and OUTFIT MNSQ. At the people's table, That the mean values were 0.98 and 1.00 (getting closer to 1,00, the better). In the INFIT ZSTD and OUTFIT ZSTD, That the average value in the people table is 0.4 And 0.4 (getting closer to 0.0, That better quality). While in item table, That Nilai INFIT MNSQ and OUTFIT MNSQ is 0.97 and 1.00 (That closer to 1,00, the better). That The INFIT ZSTD and OUTFIT ZSTD values in the item table are 0.3 and 0.0 (getting closer to 0.0, the better the quality).

Based on analysis data shows those items that were most difficult for respondents to agree with and easiest to agree with. Based on Figure 2, item 6 shows an item logit value of 0.85, which means that respondents have the most difficulty agreeing with item number 6. This conclusion is based on that the logit value of item 7 is greater than the other items. When item 17 shows a log item value of 0.80, most respondents easily agree with item number 3. This conclusion is based on the logit value of item 3 which is smaller than the other items. When differentiate among them, we have to compare nilai INFIT MNSQ with sum of means and standard deviations. Inside This particular case, the calculation result is 0.97 + 0.14 = 1.11. The text goes on to state that greater logit value show inappropriate items. Based on Figure 4, items that are not suitable identified and that require revision are the M9, S17, S18, S22, and S24. The revised results are presented in Table 5. Unidimensional showed in Figure 2.

Table 5. Item Revision Results

Item Code	Original Statement	Revised Statement
M9	I feel intimidated by challenging tasks and often avoid them.	I tend to avoid difficult tasks because I feel afraid or stressed.
S17	I believe and I realize the power I have.	I'm sure that's the ability I have.
S18	I found it hard to believe and realize it was a power I had.	I feel insecure about the abilities that I have.
S22	I often feel confused and don't have a clear goal in doing various things.	I feel confused and don't know my purpose in doing things.
S24	I often feel like I lose motivation to develop myself.	I feel lazy about learning new things.

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       Table of STANDARDIZED RESIDUAL variance (in Eigenvalue units)
                                               -- Empirical --    Modeled
       Total raw variance in observations   =      50.5 100.0%      100.0%
         Raw variance explained by measures =      18.5  36.7%       34.0%
           Raw variance explained by persons =      3.8   7.5%        6.9%
           Raw Variance explained by items  =      14.7  29.2%       27.1%
       Raw unexplained variance (total)     =      32.0  63.3% 100.0%  66.0%
         Unexplned variance in 1st contrast =      13.1  25.9%  40.8%
         Unexplned variance in 2nd contrast =       8.3  16.5%  26.0%
         Unexplned variance in 3rd contrast =        .9   1.9%   3.0%
         Unexplned variance in 4th contrast =        .9   1.8%   2.8%
         Unexplned variance in 5th contrast =        .7   1.3%   2.1%
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Figure 3. Unidimensional

Unidimensional analysis served in Figure 3 objective the make sure that the instrument of self-efficacy able to measure That intentional build. The analysis the results show that raw data variance values is 36,7%, exceed least one-dimensional 20% requirement. Therefore, it can be concluded thus instrument have a very good ability to measure self-efficacy construct, which is the measurement target.

Discussion

This study provides strong psychometric evidence for the developed Self-Efficacy Scale for Distance Learning (SESDL). High reliability is demonstrated by Cronbach's alpha, Composite Reliability, and Average Variance Extraction (AVE) values which exceed applicable standards. (Watt et al., 2019; Wojtycka, 2020). showing strong internal consistency and convergent validity(Altunçekiç & Birbudak, 2020; Levterova-Gadjalova & Tsokov, 2020; Li et al., 2023). These results are in line with or even exceed previous research, indicating the reliability of this instrument in measuring self-efficacy. The strong unidimensionality analysis confirmed that the instrument effectively measured the targeted self-efficacy construct, according to its purpose, strengthening its construct validity. Additionally, the excellent fit of the confirmatory factor analysis (CFA) model, demonstrated by RMSEA, SRMR, CFI, and TLI values that align with established guidelines (Suwan-Ampai et al., 2020; Teye-Kwadjo, 2023), indicates that the proposed model accurately reflects the data and the relationship between variables in self-efficacy. Revision of items based on item fit analysis increases item clarity and relevance, ensuring that items accurately reflect the constructs being measured, aligning with content validity goals. The findings of this study provide strong empirical support for existing theoretical models of self-efficacy, especially in the context of multidimensional measurements

that include generality, magnitude, and strength. The findings of this study enrich seminal work on self-efficacy, which emphasized the predictive power of self-perceptions of efficacy in a variety of contexts (Suryaratri et al., 2023; Susilowati et al., 2020) The measurement of self-efficacy was multidimensional in this study, including generality, magnitude, and strength, underscoring the importance of task difficulty, certainty of task implementation, and level of generalization of beliefs. By introducing a comprehensive and reliable self-efficacy instrument, this research contributes to the existing literature on self-efficacy assessment (Pampaka et al., 2023; Pudritz et al., 2020).

A reliable and valid Self-Efficacy Scale for Distance Learning (SESDL) has significant practical implications in various fields. In the context of distance education, this instrument can be used to develop effective interventions to increase students' self-efficacy, which in turn can improve their motivation, academic achievement, and psychological well-being. Utilization of valid and reliable self-efficacy instruments, as identified in this research, is very important in developing effective interventions to increase student self-efficacy in distance learning(Liwanag & Galicia, 2021; Masitoh & Fitriyani, 2020; Mercado Jr & M., 2021). This instrument allows educators and researchers to accurately measure students' levels of self-efficacy and design interventions tailored to the dimensions of self-efficacy (general, magnitude, and strength). By considering the influence of cultural context, interventions can be designed to be more culturally sensitive and effective in supporting the self-efficacy of students from various backgrounds. Additionally, interventions can be enriched by integrating factors such as emotional intelligence and learning motivation, to create a comprehensive approach that increases students' self-confidence and success in distance learning (Muhariyansah et al., 2020; Ozaydin Ozkara & Ibili, 2023).

The implications of this research have a significant impact on various parties in the world of education. For educators and educational institutions, this scale can be used as an evaluation tool to understand students' level of self-efficacy in the context of distance learning. With this understanding, educators can design more targeted strategies and methods to increase students' self-confidence in overcoming distance learning challenges, such as improving time management skills, learning independence, and using technology. For curriculum developers, this scale can also be a reference in designing materials and activities that better support students' self-efficacy needs in a learning environment that is flexible but demands high independence. In addition, this research paves the way for further studies regarding the factors that influence self-efficacy in PJJ and its relationship with academic success, so that it can contribute to the development of educational policies that are adaptive to changes in technology and social conditions. Although this research provides a significant contribution For the development and validation of the Self-Efficacy Scale for Distance Learning (SESDL), there are several limitations that need to be acknowledged. First, this research only focuses on students at one open university, so further research is needed to test this instrument on students from various institutions and educational backgrounds. Second, this study only measured self-efficacy at one time. Longitudinal research can provide deeper insight into the development of self-efficacy over time and its impact on distance learning.

4. CONCLUSION

Based on the research results, the results show that the instrument shows good psychometric quality, with high reliability and validity, and the model fits well. These findings provide a significant contribution to the self-efficacy literature, especially in the distance learning context. Based on the results of this study, it is recommended to conduct further research using self-efficacy development instruments. Future research could involve larger and more diverse samples and test the effectiveness of these instruments in predicting student academic achievement in distance learning. In addition, research can also develop self-efficacy-based interventions tailored to the specific distance learning needs of students, as well as explore the relationship between self-efficacy and various other factors relevant to distance learning.

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