

## Validating a self-rating scale for self-directed learning instrument

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### Abstract

The validity of a questionnaire depends on the language and context in which it is used. Validation of an already existing questionnaire, therefore, provides its content, validity and reliability for use in new contexts. The original self-rating scale for self-directed learning (SRSSDL) questionnaire was developed and validated among English first-language speakers. The current exploratory sequential mixed methods study validates the same instrument among users of English as a second language (ESL) in the Northwest Province of South Africa. In the qualitative part, 10 expert teacher-educators examined the content validity of the test through 2 Delphi technique cycles. The quantitative part offers descriptive and inferential statistics of the results of the revised SRSSDL instrument after completion by 42 high school science teachers. The split-half method of the 60-item revised SRSSDL instrument yielded Cronbach's alpha values for part 1 and part 2 p-values of 0.740 and 0.842, confirming internal consistency reliability. The Guttman split-half coefficient of 0.800 confirms good reliability level. The Spearman-Brown correlation coefficient for equal and unequal lengths of 0.807 confirms a strong positive correlation between the two parts. The Shapiro-Wilk and Kolmogorov-Smirnov tests confirm statistically good normality levels with p-values of 0.966 and 0.101 at 0.251 and 0.200 significance levels, respectively. The data shows acceptable Kurtosis and skewness values of -0.833 and 0.228, respectively. The validation process ensured the suitability of an existing questionnaire in a different context compared to where it was developed. The current study provides a revised SRSSDL instrument valid for use among high school teachers and university lecturers using ESL in South Africa. Nevertheless, a larger sample involving participants from all provinces could yield more conclusive results.

**Keywords:** self-rating scale for self-directed learning, validation, self-directed learning, reliability

## INTRODUCTION

The self-rating scale for self-directed learning (SRSSDL) was initially developed and validated by Williamson (2007) to test the self-directed learning (SDL) of medical professionals in the United Kingdom (UK). The SRSSDL instrument passed all tests and was declared valid for assessing the SDL readiness of nursing students. SDL occurs when learners are in charge of their own learning, setting the pace of what and how they learn, with the guidance of the teacher (Knowles, 1975). Self-directed learners are able to select their own strategies, and learning needs to accomplish their goals through practice (Vareberg & Platt, 2024). Self-directed learners exhibit internal motivation to accomplish and solve problems, grow in capacity and demonstrate self-

direction through enriched learning experiences (Knowles, 1975).

SDL learners accomplish their goals by working individually or cooperatively, planning and executing set targets using various sources. This encourages self-assessment and peer-assessment among learners, using critical thinking to solve problems and generate new theories (Vareberg & Platt, 2024). During SDL, the educator guides the students rather than telling them information, so that they take responsibility for their learning and become self-directed (Bosch et al., 2019). Self-directed teachers may search for unique teaching methods which encourage SDL among the learners instead of using passive teaching methods.

### Contribution to the literature

- The current study contributes to literature by providing an assessment of the content validity of the original SRSSDL instrument for use among second language English speakers. It provides content validation of the revised SRSSDL instrument.
- The current study provides evidence of the reliability of the revised SRSSDL instrument for use among speakers of English as second language (ESL) in South Africa.
- The study provides a copy of the revised SRSSDL instrument validated for use among speakers of ESL.

### Scientific Value

A validated instrument should correctly measure what it is intended to measure, depending on language comprehension of the respondents (Mohamad et al., 2022). It is essential to validate any questionnaire to test its relevance for use in any targeted new context. There is no evidence in literature of any study where the SRSSDL was validated in the said context in South Africa. The current study is the first stage of a large project which aims to investigate the impact of teacher professional development strategies on the teachers' SDL skills in the current context. The revised SRSSDL instrument will be contextualized and relevant for use in future studies of the same project. Researchers who wish to use the revised SRSSDL in the current context may not need to go through the validation process but use this contextualized instrument. The teachers in this context may benefit from the revised SRSSDL instrument by assessing their own SDL skills for personal and professional development. Teacher educators in the same locale may use the tool to determine the SDL skills of pre-service teachers before and after teacher training. This could help them to assess SDL skills of the trainee teachers and determine the effectiveness of the training program. On a similar note, policy makers may also be informed of the need to change training programs to enhance the development of SDL skills in the said context.

There are many SDL questionnaires which have been developed and validated for use on specified samples of participants. These include the self-directed learning readiness scale (SDLRS) developed by Guglielmino (1977) and validated among participants in the United States of America and Canada. The instrument has been adapted and used in many countries including Spain, Cuba, and France, among many others. In most of these countries, the SDLRS was translated to the language of the participants to suit the context. For example, a Chinese version of Guglielmino's (1977) instrument was developed by Deng (1995) for use among university students in Hong Kong.

Another instrument SRSSDL instrument developed by Williamson (2007). The SRSSDL was initially developed for use among nursing students, who were first language English speakers in the UK. The self-directed learning instrument was developed and validated by Cheng et al. (2010) among Taiwanese

nursing students. Yet another SDL instrument was developed by Fisher et al. (2001) in Australia among nursing students, the SDLRS.

The SRSSDL was used among different people and cultures without validation. For example, the SRSSDL was successfully used among Nepalese nursing students (Koirala et al., 2021), Indian medical students (Kiran & Hema, 2024), and among prospective Indonesian biology teachers (Firdaus et al., 2024). The instrument was also used among Taiwanese middle and adult learners (Liao et al., 2024), among higher education students in the UK (Mbeau-ache et al., 2021), and pre-service teachers in Slovenia (Avsec, 2018). The SRSSDL tool was successfully used among Nigerian medical students (Nottidge & Louw, 2017), and among engineering university students in South Africa (Swart & Havenga, 2022).

The instrument was also used to assess the SDL perceptions of Pakistani nursing students by gender (Richard et al., 2022). Pre-test post-test use of the SRSSDL showed high SDL with no statistical difference among Indian medical graduates (Murthy & Mohanram, 2024). No correlation was found between the South African geography pre-service teachers' SDL readiness and the teaching method used (Golightly, 2019). Structured group activities improved the evaluation component of SDL readiness among South African first year Education students (Breed, 2016). Arabic pre-service teachers improved critical reading skills, critical thinking skills, and self-regulated skills (Al-Shaye, 2021). The validity of the SRSSDL instrument has not been tested for use in the South African context. The global use of the SRSSDL and its adaptation to different contexts illustrates the need for validation of this instrument for its use for speakers of ESL.

The SRSSDL was initially validated for use in several countries, to ensure contextual fitness. Such examples include its validation in Italy where it was translated to Italian and subsequently reduced to 40 items (Cadorin et al., 2010). The validation conducted in Taiwan yielded a 25-item version used on middle-aged adults (Liao et al., 2024). This revised 25-item SRSSDL Taiwanese version was found valid in measuring SDL readiness of middle-aged and older adults (Liao et al., 2024). Validation of the SRSSDL instrument among Iranian medical students yielded a 53-item version which was found fit for use in that context (Gordanshekan et al., 2012). The validation

of the SRSSDL in Thailand showed excellent internal consistency and content validity (Onsawarng et al., 2024). The SRSSDL was also validated for its effectiveness in evaluating British health sciences students' SDL readiness (Williamson & Seewoodhary, 2017). Even though the original version of SRSSDL was developed by Williamson (2007) in the UK, it was validated in the UK and by others among similar contexts and cultures.

The validity of an instrument depends on the sample on which it is used. An instrument may therefore be valid when used among one group of people but may not be valid in a different culture and language (Mohamad et al., 2022). The validity of a data collection instrument ensures the validity of the findings derived from a study in a particular context (Karunaratna et al., 2024). This, therefore, justifies the validation of instruments when they are intended for use in new contexts.

### Aim and Objectives

The literature does not show evidence of the validation of the SRSSDL instrument in South Africa. The current study, therefore, aimed to validate the SRSSDL instrument for use among speakers of ESL in the Northwest Province of South Africa. The study assessed the language and the statistical validity of the edited version of the SRSSDL instrument in the South African context. This validation was necessary so that the SRSSDL instrument could be suitably used for measuring the SDL skills of teachers in the said context.

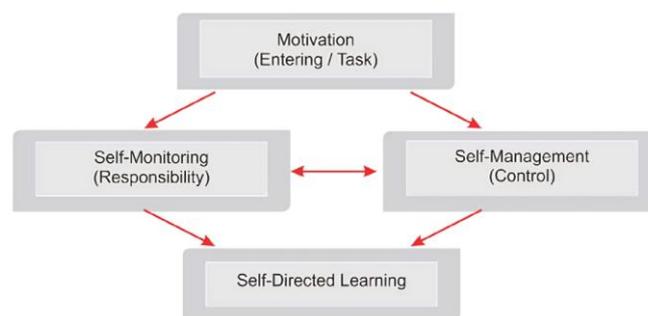
The objectives of the current study were:

1. To perform construct validation of the original SRSSDL instrument to determine its suitability for use among ESL teachers in the Northwest Province of South Africa.
2. To determine the reliability and validity of using the revised SRSSDL tool in the said context.

## THEORETICAL FRAMEWORK

The current study was guided by Garrison's (1997) model of SDL. This model emphasizes that a learner must have control and responsibility over their learning process. The key components of this model are self-management, self-monitoring, and motivation. In this respect, teachers, just like learners, actively manage the learning context, monitoring their cognitive processes, and being motivated to engage in meaningful learning experiences (Garrison, 1997). **Figure 1** shows Garrison's (1997) model of SDL.

Garrison's (1997) model emphasizes the learner's active role in the learning process. It also reiterates the interconnectedness of self-management, self-monitoring, and motivation for successful SDL. The teachers ought to have self-management and self-



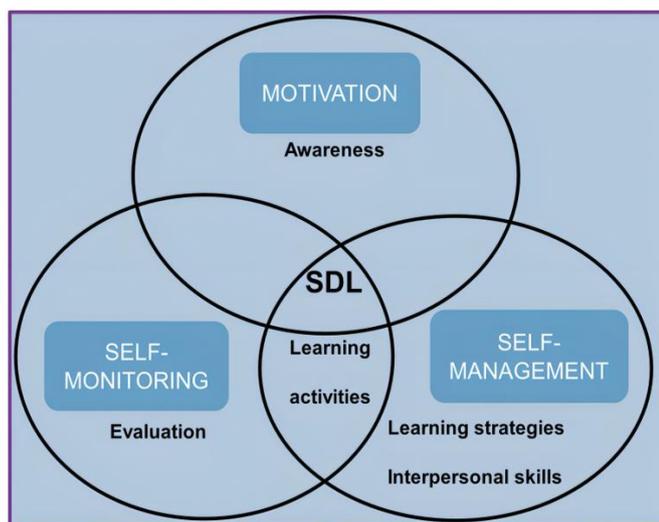
**Figure 1.** Garrison's (1997) dimensions of self-directed learning

motivation so that they are effective in their career. The model acknowledges the influence of the learning environment on SDL, and how these factors affect self-direction. This is essential for teachers to effectively create ideal learning environments for their learners. The model promotes learning that is valuable to the learners and not just task oriented. Garrison's (1997) model provides a framework for educators to enhance SDL by designing learning experiences which improve self-direction, and teaching students how to monitor their own learning. Educators create learning contexts that encourage intrinsic motivation (Garrison, 1997).

Garrison's (1997) model of SDL was an ideal theoretical framework for the current study which sought to validate the SRSSDL instrument. For teachers to be self-directed, they should be motivated. Motivation leads to self-monitoring and self-management. Self-directed teachers exhibit internal motivation (Knowles, 1975) which is essential for solving problems. Because they are motivated, teachers are in charge of their own learning (Knowles, 1975). Self-directed teachers demonstrate self-motivation by selecting their own strategies and learning needs (Vareberg & Platt, 2024). Because of self-monitoring, they grow in capacity through enriched learning experiences. They possess self-management as they pace their own learning and learning activities (Knowles, 1975).

Self-management entails the teachers' learning ability to control and organize the learning environment and resources. Such teachers can self-manage, can control time, set learning goals, and use appropriate learning strategies (Garrison, 1997). Self-monitoring is the learners' capacity to observe and evaluate their own cognitive processes. This includes their understanding, learning strategies, and learning progress. These learners possess metacognitive awareness and ability to adjust learning strategies (Garrison, 1997). Motivation entails the learner's internal engagement in the learning process, involving both intrinsic and extrinsic motivation (Garrison, 1997). These aspects form the internal structure of the SRSSDL instrument.

Williamson's (2007) SRSSDL instrument measures SDL skills and is composed of five dimensions: Awareness, learning strategies, learning activities,



**Figure 2.** Alignment of Garrison's (1997) SDL model and Williamson's (2007) SDL instrument

evaluation, and interpersonal skills. Williamson's (2007) SRSSDL is aligned with Garrison's (1997) SDL model used in the current study as the theoretical framework. Self-management on Garrison's (1997) SDL model is aligned to learning strategies, learning activities and Interpersonal skills on the SRSSDL instrument. A learner who understands suitable learning strategies and activities demonstrates self-management. Such a learner will show interpersonal skills by relating with peers. Self-monitoring aligns with the evaluation and learning activities on SRSSDL instrument. A learner who can monitor their own learning can evaluate their own progress and identify learning needs essential for their improvement and hence can select suitable learning activities. The motivation dimension relates to Awareness dimension. A motivated learner demonstrates awareness of what they are learning. **Figure 2** shows the proposed model of how Williamson's (2007) SRSSDL instrument aligns with Garrison's (1997) SDL model which is the theoretical framework of the current study.

The combination of the dimensions of motivation, self-monitoring, and self-management results in SDL. The current study is situated on the role of the revised SRSSDL to access SDL skills of the teachers in the said context.

## RESEARCH METHODS AND DESIGN

### Study Design

The current study followed a mixed-methods approach. The research design was an exploratory sequential design where at first qualitative data was collected followed by quantitative data (Creswell & Inoue, 2025). The qualitative section entailed the Delphi technique of the original SRSSDL by two panels of expert teacher educators to establish the content validity (Karunarathna et al., 2024). The quantitative section

involved the construct reliability assessment of the consistency and precision of an instrument to measure a construct in the South African context.

### Setting

The study was carried out in the city of Mafikeng in the Northwest Province of South Africa. The socio-economic status of the participants in this setting is low to medium income, and the place is largely rural. Teacher educators from a local university and physical science teachers from the township schools participated in the study. All the participants were black and ESL speakers. Most people in South Africa are settled according to their respective languages and cultures. Most people in the locale speak Setswana as their first home language. There are 11 official home languages in South Africa, which represent different cultures though there may be small similarities in language. South African teachers lack the necessary vocabulary to speak or comprehend English language terms (Hugo & Nieman, 2010). This was also observed among secondary school teachers who fluidly use English and home language in teaching content subjects like mathematics (Sepeng, 2015). The current study is the early stage of a large project aimed at assessing the SDL skills of ESL physical science teachers in the said part of South Africa. The main project involves the use of intervention strategies on participants in the same area to mitigate their level of SDL skills where necessary. The main study also intends to evaluate the teachers' awareness of SDL and its influence in their planning and teaching strategies. For these reasons, validating the original SRSSDL instrument was necessary from the very start of the project. The authors and reviewers of the main project felt that using an uncontextualized SRSSDL instrument could negatively affect the findings in the rest of the project.

### Study Population and Sampling

The ten teacher educators who participated in the Delphi technique had at least ten years of experience as teacher trainers. The first group of teacher-educators were three males and two females, while the second group were two males and three females. Ten years of experience as teacher educators was deemed sufficient for the participants to provide valuable expert judgment on the content validity of the instrument. The experienced teacher educators were also ESL speakers and therefore ideal for validating the original SRSSDL in the said context. The Delphi panelists were experienced teacher educators. We did not find any previous study done in the said context, which examined the SDL abilities of the teachers, instrument validation or psychometrics. It appears to indicate that the said context may have been isolated concerning research in the said dimensions. We expected the panelists to use their expertise as experienced teacher educators and ESL

**Table 1.** Demographic characteristics of participants for the quantitative part

	Category	Male	Female	Sample total
Age	20-29	5	7	12
	30-39	9	8	17
	40-50	4	3	7
	51 and above	2	4	6
Teaching experience	10-15 years	7	15	22
	16-20	8	4	12
	Above 20	5	3	8

Note. Total: 42 (male: 20 & female: 22)

speakers with same home language, to be suitable criteria to validate the original SRSSDL in the said context. The panelists possessed similar qualities with the would-be users of the revised SRSSDL instrument. They were, therefore, suitable fit since also they possessed professional qualities of experience in teacher training.

The participants for the quantitative part of the current study were 42 in-service secondary school physical science teachers. There were 20 male and 22 female teachers from schools of medium socioeconomic status who were conveniently and purposefully sampled (Junus et al., 2021). They were conveniently sampled because they worked in the same town where the researcher was based, therefore allowing for easy accessibility. They were also purposively sampled because they were experienced teachers of physical science, an area where the validated instrument was to be used. **Table 1** shows the demographics of the participants.

### *Part 1. Content validity of the SRSSDL instrument*

The Delphi technique entails the process of generating items for an instrument by involving expert panels to establish content validity (DeVellis, 2017). It involves two or more surveys with feedback and refinement of the instrument until it has reached acceptable levels of content validity.

Content validity in the form of face validity using experts' judgment was employed to measure if the tool measured what it intended (Mohamad et al., 2022). This was an important step to align the instrument to context. In the current study the Delphi technique was done by two blind panels of different groups of five expert teacher educators from a local university. Each teacher-educator independently and individually used a 5-point Likert scale which ranged from strongly disagree (1) to strongly agree (5) to determine the content validity of each item in the SRSSDL tool for use among in-service teachers. The experts had an option for suggesting editing any of the items for whatever reason. To make decisions on each item on the SRSSDL tool, at least 75% consensus from the panelists was needed (Barrios et al., 2021). This was applied for both rounds of the Delphi technique. After the first round of expert assessment,

modifications were made before sending the tool to the second panel. This was essential so that the content analysis is not duplicated, and so that the decision taken for each item is reassessed by a second panel of equally experienced teacher-educators. Some changes of such words on the revised SRSSDL may appear irrelevant to some readers but they mean a lot more for ESL speakers. The participating teachers are in similar contexts to those who cannot teach a mathematics lesson in English without switching to home language (Sepeng, 2015).

### *Part 2. Testing of normality of the data*

Testing the normality of the data is essential to validate the tests of reliability of the instrument (Mishra et al., 2019). Before applying the Cronbach's alpha, it is critical for the data to be normally distributed. For this reason, the current study performed visual methods, descriptive and inferential statistics to test the normality of the data.

Visual methods used in the current study were the histogram and the normal Q-Q plots. Descriptive statistics were done in the form of means, variances, range, standard deviations, skewness and kurtosis. This was meant to give a perspective of the data which was used. Inferential statistics used in the current study were the Shapiro-Wilk and the Kolmogorov-Smirnov (Mishra et al., 2019).

### **Visual Tests of Normality**

Visual methods in the form of histogram and the normal Q-Q plots were employed to test the normality of the data.

A histogram describes a normal distribution as one which starts off at low values with gradual increase until reaching a single peak halfway through the graph. From the mid-point there is a decline towards the last recording (Habibzadeh, 2024). A normal distribution histogram is characterized by a symmetrical bell shape and gradual tapering (Hair et al., 2022). A histogram which shows non-normal distribution has multiple peaks, asymmetrical patterns and is skewed (Hair et al., 2022). **Table 2** shows summarized characteristics of a histogram.

Skewness shows how symmetrical a data distribution is. Good skewness values are between -1 and +1, while -2 to +2 is acceptable, and values beyond -2 and +2 suggest non-normal distributions (Hair et al., 2022).

Kurtosis is a statistical measurement that indicates how tailed the data is, relative to a normal distribution. Positive kurtosis shows a peaked distribution, while negative kurtosis means a flat one (Hair et al., 2022). A too peaked distribution shows kurtosis value greater than +2, while less than -2 indicates a too flat one. Skewness and kurtosis close to zero show a normal distribution (Hair et al., 2022).

**Table 2.** Characteristics of a normal distribution histogram

Description	Normal distribution	Non-normal distribution
Bell-shaped	Symmetrical, majority of data points around mean	Asymmetrical, skewed distribution, outliers
Peaks	Single-peak, unimodal	Multiple peaks, multimodal
Tails	Gradual tapering	Heavy tails

**Table 3.** Characteristics of a Q-Q plot

Description	Normal distribution	Non-normal distribution
Line	Straight line	S-shaped skewness
Curvature	No curvature	C-curve
Deviations	Gradual tapering	Inverted S-shape
Tails	Systematic	Outliers

**Table 3** shows the characteristics of a quantile-quantile (Q-Q) plot assessed by checking the line, curvature, deviations and tails of a distribution. A normal Q-Q plot is associated with a straight line, no curvature, gradual tapering and systematic tailing. A non-normal distribution is characterized by an s-shaped skewness, C-curve, an inverted S-shape and outliers.

### Confirmation of Normality of Data Using the Shapiro-Wilk and the Kolmogorov-Smirnov Statistics

Inferential statistical methods in the form of The Shapiro-Wilk and the Kolmogorov-Smirnov tests were used to statistically infer the distribution of the data. These statistics were used to confirm the visual impressions in terms of quantities. This stage was necessary to overcome the limitations of the visual techniques (Mishra et al., 2019). The goal of applying Shapiro-Wilk was to provide a statistical decision criterion. The Kolmogorov-Smirnov test was applied after Shapiro-Wilk to confirm the previous findings. Kolmogorov-Smirnov test is more sensitive to kurtosis while Shapiro-Wilk is more sensitive to skewness (Yazici & Yolacan, 2006). Literature indicates that the sample sizes applicable for Shapiro-Wilk tests are in the range of 3 to 50 (Mishra et al., 2019). Sensitivity of this test increases with the increase in sample size. Therefore, a sample of 42 was acceptable to successfully apply in this case. However, the tests were also supported by the use of visual and descriptive methods.

In the current study p-value of 0.05 was used for both Shapiro-Wilk and Kolmogorov-Smirnov statistics. For Shapiro-Wilk, any computed p-value greater than 0.05 support the normality of the data ( $H_0$ . data is likely normal). Computed significance values less than 0.05 supports the alternative hypothesis ( $H_1$ . data unlikely normal). The level of significance of the Shapiro-Wilk was similar to the Kolmogorov-Smirnov statistics. Kolmogorov-Smirnov is a non-parametric statistical test which compares cumulative distribution of two data sets. If Kolmogorov-Smirnov statistics yield p-value greater than the level of significance (0.05) data is normally distributed. If less than the significance value, then the data is non-normal (Yazici & Yolacan, 2006).

**Table 4.** Interpreting the Cronbach’s alpha reliability levels

Reliability level	Interpretation
0.9-1.0	Excellent
0.8-0.89	Good
0.7-0.79	Acceptable
0.6-0.69	Questionable
< 0.6	Poor

### Part 3. Testing reliability of the SRSSDL

Construct reliability assesses the consistency and precision of an instrument to measure a construct (Bhattacharjee, 2012).

#### Test of Internal Consistency and Reliability

The questions for the pilot survey were divided into two equal parts of 30 each (odd and even numbers). To test the internal consistency reliability of the SRSSDL instrument the Cronbach’s alpha was used. Cronbach’s alpha measures the internal consistency to test whether a collection of items consistently measures the same characteristics (Mohamad et al., 2022). The Cronbach’s alpha test of reliability was graded using the scale as shown in **Table 4**. The Spearman-Brown correlation coefficient for equal length was adopted for the current study to test the reliability of the two parts. This was used to complement the results from the Cronbach’s alpha test (Mohamad et al., 2022). Spearman-Brown is ideal for the small sample size and is less biased than Cronbach’s alpha.

Guttman reliability calculates the reliability of an instrument by splitting the tool into two halves and comparing the scores of each half (Talli, 2019). The Guttman split-half was used after the Spearman-Brown coefficient to provide robust evidence of internal consistency. The Cronbach’s coefficient measure of reliability was used to test the reliability of the entire 60-item SRSSDL instrument.

## RESULTS

### Results of Construct Validity of the SRSSDL Tool

The first round of the Delphi technique retained 50 items on the SRSSDL tool unmodified. All five experts in the first round did not suggest any editing for these items and agreed or strongly agreed the participants would understand them without difficulty. The remaining 10 items were deemed unclear and suggestions for editing were provided. The suggested changes are indicated in **Table 5**.

**Table 5.** Changes made to the SRSSDL tool after the first round Delphi technique

Item	Original phrase	Adopted phrase
6	“deficit”	“where I need to learn”
10	“routine”	“timetable”
15	“role play”	“practicing roles”
17	“simulations”	“videos”
21	“routine”	“timetable”
30	“annotated”	The word was removed
41	“peer reviewed”	“marked by others”
47	“learning challenge”	“new things to learn”
57	“social harmony”	“peace”
60	“culturally diverse milieu”	“different cultures”

**Table 6.** Frequency table of the first round Delphi technique

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Frequency	6	14	20	18	242
Percentage	2.0	4.7	6.7	6.0	80.7

**Table 7.** Delphi results for testing content validity of the SRSSDL tool

Round	Total number of items	Number of items retained	Number of items changed
1	60	50	10
2	60	60	0

The changes indicated in **Table 5** were precautionary to avoid the participants misunderstanding and possibly confusing the statements in the items. The scores from the first round of the Delphi technique are depicted in **Table 6**. **Table 6** illustrates how the responses of the experts were distributed on the 5-point Likert scale.

The results from **Table 6** indicate that the expert teacher-educators agreed on more than 80% of the items. This was regardless of the few corrections indicated in **Table 5**.

The suggested changes from the Delphi technique round 1 were done on the SRSSDL tool before it was issued to a second team of experts. All the 5 experts did not identify any suggestion for change. **Table 7** shows the results of the two rounds of the Delphi technique.

All the experts in the second round agree or strongly agreed that the items would be understandable by the said participants. The two rounds were deemed sufficient since the first round showed over 80% agreement and the second round showed 100%. The edited version of the SRSSDL in the annexure was used for data collection with the 42 consenting teachers. The more than 75% agreement of teacher educators in the first round for changes made on the original SRSSDL instrument implies that the original instrument had shortfalls for reliable use in the current context. The consensus of the experienced teacher educators in the second Delphi cycle implies that the revised SRSSDL instrument possesses robust construct validity for use in

**Table 8.** Descriptive statistics

		Statistics	SE
IYPL	Mean	4.0369	0.04369
	95% confidence interval	LB	3.9487
	for mean	UB	4.1251
	5% trimmed mean		4.0354
	Median		4.0000
	Variance		0.0800
	Standard deviation		0.2831
	Minimum		3.5000
	Maximum		4.5500
	Range		1.0500
	Inter-quartile range		0.4500
	Skewness	0.2280	0.36500
	Kurtosis	-0.8330	0.71700

Note. SE: Standard error; LB: Lower bound; & UB: Upper bound

the current context. This implies the revised SRSSDL has good construct validity for use in the current or similar context. The revised SRSSDL instrument may reliably be used to assess the SDL skills of teachers in the said context.

### Results for Testing of Normality of the Data

The results from the analysis of data on the teachers’ SDL readiness shows an average score of 4.0369, indicating that on the average the teachers were often ready for SDL. The least score obtained was 3.5000 while the highest score was 4.5500. The median of the data was 4,000, showing the highest peak of the bar graph. **Table 8** shows the results of the descriptive statistics.

The skewness and kurtosis statistics recorded 0.228 and -0.833 at standard errors of 0.365 and 0.717, respectively. The values indicate a normal distribution of the data with excellent skewness.

### The Histogram and the Normal Q-Q Plots

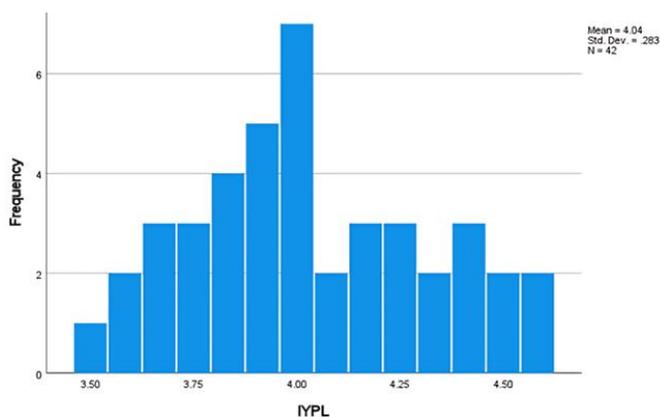
The histogram showed one median, and the normal Q-Q plots show no outliers in the data which confirm the normality of the data.

The histogram had a single, gradual tapering on the left side and most of the data point were around the mean. It almost showed a bell-shape. This indicates a fairly normal distribution of the data using the visual method. **Figure 3** shows the histogram for assessing the distribution of data visual methods.

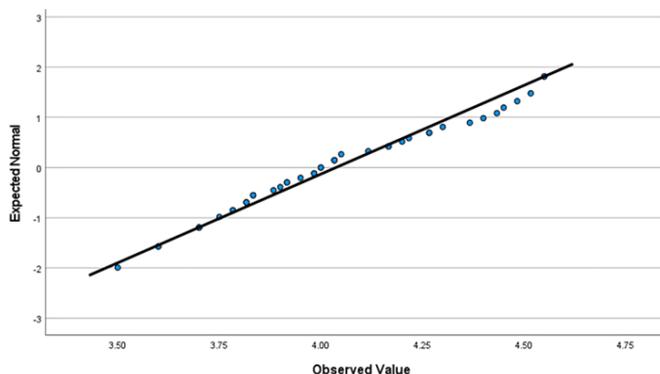
**Figure 4** shows the results of a normal Q-Q plot for visual distribution of data. The graph shows a straight line, no curvature, gradual tapering and systematic tailing. This shows that the data was normally distributed.

### Exploratory analysis

The normality test was adopted to check if the data is normally distributed. For the sample size in this study,



**Figure 3.** Histogram for visual data distribution (Source: Author’s own elaboration, using SPSS Version 29)



**Figure 4.** Normal Q-Q plot for visual data distribution (Source: Author’s own elaboration, using SPSS Version 29)

**Table 9.** Tests of normality (df = 42)

	Kolmogorov-Smirnov		Shapiro-Wilk	
	Statistics	Sig.	Statistics	Sig.
SRSSDL (IYPL)	0.101	0.200*	0.966	0.251

Kolmogorov-Smirnov test was used. At p-value of 0.05 the computed significance value was 0.200. This shows it is not statistically significant and the null hypothesis that it follows a normal distribution could not be rejected. We conclude that the data follows a normal distribution. Similarly, the Shapiro-Wilk statistic at p-value of 0.05 was 0.251, a value greater than 5%. We cannot reject the null hypothesis, and this confirms a normal distribution of the data. **Table 9** shows the Kolmogorov-Smirnov and the Shapiro-Wilk statistics.

### Results for Testing Reliability of the SRSSDL

#### Measure of reliability

**Split half procedure for reliability:** The questions for the pilot survey were divided into two equal parts of 30 each (odd and even numbers). The Cronbach’s alpha value for part 1 is 0.740 while that of part 2 is 0.842. These values show that the instrument has an acceptable internal consistency. The Guttman split-half coefficient was 0.800, indicating a good reliability level. These results show that the items in the revised SRSSDL

**Table 10.** Reliability statistics (N = 60 [N<sub>P1</sub> = 30 & N<sub>P2</sub> = 30])

Statistics	Value
Correlation between forms	0.676
Spearman-Brown coefficient-Equal length	0.807
Spearman-Brown coefficient-Unequal length	0.807
Guttman split-half coefficient	0.800

Note. N: Number of items; P: Part; & Cronbach’s alpha value = 0.740 (P 1) & 0.842 (P 2)

**Table 11.** Reliability and scale statistics (N = 60)

Reliability statistics		Scale statistics	
Cronbach’s alpha	Mean	Variance	Standard deviation
0.878	242.210	288.611	0.16989

Note. N: Number of items

instrument are moderately correlated and measure a single construct.

To check the reliability between the two parts, the Spearman-Brown correlation coefficient for equal and unequal lengths was adopted. The Spearman-Brown coefficient for equal and unequal lengths were both 0.807, which is an indication of strong positive correlation between the two parts as displayed in **Table 10**. The positive correlation of the two equal and unequal parts of the items in the revised SRSSDL instrument indicates strong correlation of the items and hence confirms the internal consistency of the instrument. This implies that the revised SRSSDL has sufficient reliability to be used to assess the SDL skills of teachers in the said context.

#### Use of Cronbach’s Coefficient Measure of Reliability

The reliability of the instrument was examined using the Cronbach’s coefficient measure of reliability. The result displayed in **Table 11** shows that the Cronbach’s alpha value is 0.878, which confirms that the instrument is highly reliable. This implies that the items in the revised SRSSDL instrument display high consistency and would produce the same results if the test is repeated without errors. The internal consistency of the revised SRSSDL instrument indicates that the items correlate with each other. This implies the revised SRSSDL instrument is reliable when completed by a sample of participant teachers as in the said context. Therefore, when the SRSSDL is used in a similar context, reliable results will be produced.

### DISCUSSION

The SRSSDL questionnaire showed strong internal consistency reliability (Cronbach’s alpha = 0.74 and 0.842) for first and second splits, respectively. The results were consistent with previous findings (Onsawarnng et al., 2024). The Guttman split-half coefficient was 0.800, confirming a good reliability level (Talli, 2019). A strong positive correlation between the two parts was confirmed by the Spearman-Brown correlation

coefficient for equal and unequal lengths which stood at 0.807 (Mohamad et al., 2022). Cronbach's alpha of the entire questionnaire stood at 0.878, further confirming strong internal consistency reliability of the SRSSDL questionnaire (Mohamad et al., 2022). The adapted form of the SRSSDL questionnaire has strong internal consistency reliability for use among lecturers and teachers in South Africa.

The data showed Kurtosis value of -0.833 and the skewness of 0.228, indicating an acceptable normal distribution (Hair et al., 2022; Mishra et al., 2019). The normality of the data was also visually confirmed by using histogram, the normal Q-Q plots, both showing absence of outliers (Mishra et al., 2019). The absence of outliers confirms the normality of the data. The histogram equally showed normal distribution of the same data by showing absence of outliers and displaying a single median point. This was further confirmation of the normal distribution of the data (Mishra et al., 2019). Statistical tests of normality in the form of Shapiro-Wilk and Kolmogorov-Smirnov tests showed p-values of 0.966 and 0.101 at 0.251 and 0.200 significance levels, respectively. This confirmed that the level of normality of the data was statistically good (Yazici & Yolacan, 2006). Both the visual and statistical methods corroborate the normal distribution of the data. The use of various methods to confirm normal distribution was necessary to cushion possible errors which one method may display (Mishra et al., 2019).

### Limitations of the Study

The sample size for the current validation study was relatively small. For this reason, the findings from the current study may not be generalized. The experts who participated in the content validity of the questionnaire were all second-language users of the English language. Their inputs may not be valid for first language English speakers.

## CONCLUSION

The current study sought to validate the SRSSDL for its use among ESL speakers in the Northwest Province of South Africa. Experienced teacher educators served as panelists for content validity through two Delphi technique cycles. The first cycle comprised five expert panelists and yielded suggested changes to the original SRSSDL instrument. Changes were made to the original instrument following a 75% consensus of the panelists. The second cycle did not suggest changes to the first revised version of the SRSSDL instrument. The results for the second cycle showed that the revised SRSSDL instrument was suitably contextualized. This was demonstrated at the consensus of the panelists not to suggest further changes.

The second stage entailed testing the reliability of the revised SRSSDL instrument. For this stage the split half

procedure, the Cronbach's coefficient and the Spearman-Brown correlation coefficient procedures were employed. These statistical processes showed that the revised SRSSDL instrument possessed sufficient internal consistency and reliability for use among participants in the said context. This implies that the revised SRSSDL instrument possesses sufficient reliability and consistency for use in the current context to assess the SDL skills of teachers.

The third stage was the application of the revised SRSSDL instrument to a sample of 42 ESL physical science teachers in the Northwest Province of South Africa. The data from this stage was tested for normality distribution using visual, descriptive and inferential statistical methods. The visual methods employed were the histogram and the Q-Q plot. The descriptives employed were mean, median and mode. The inferential statistics were the Shapiro-Wilk and Kolmogorov-Smirnov tests. The findings from all three methods in this stage indicate the data was normally distributed.

The original SRSSDL instrument lacked sufficient construct validity for use among speakers of ESL teachers in the said context. The revised SRSSDL instrument possesses sufficient construct validity and reliability for use in the current context. The statistical processes implemented during the current study indicate acceptable levels of content validity of the revised SRSSDL instrument. The revised SRSSDL instrument shows excellent reliability for use in the current context. This study was important because the validation of the SRSSDL instrument has never done among participants in a South African context. The revised version of the SRSSDL questionnaire may be used to test the SDL skills of ESL speakers in the said context.

The current study sought to validate the SRSSDL instrument before using the contextualized instrument in the rest of the main project. There are 11 official home languages in South Africa, and each is home to a different culture. The revised SRSSDL would lack external validity when used in another province. This posed a limitation on the external validity of the findings. The revised SRSSDL instrument may not be used in the rest of the country without contextualizing. Using a sample representative of the entire country would have been impossible because of the multi-lingual and cultural setting. Performing another validation process is recommended if the setting is changed. All previous validation processes done in other parts of the world as mentioned in the introduction do not provide a suitable fit in terms of language and culture of the current context.

The study can benefit teachers in similar contexts to self-assess so that they may know their own shortcomings and devise ways to improve their SDL. The teachers who self-assess using this revised

instrument may provide their learners with appropriate assistance and teach them to be self-directed. The revised instrument may inform policy makers on decisions such as teacher professional development and revision of teacher training curriculum. The study may also help policy makers in allocating resources for improvement of teacher training programs.

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