

Research Article

Cross Cultural Adaptation of the ‘Comprehensive Evaluation of Use of Technology in Education’ Instrument for Use Among the Sinhala Speaking Nursing Students in Sri Lanka.

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Abstract

Introduction: During the COVID-19 pandemic, several educational technologies were introduced in nursing schools in Sri Lanka without evaluating their effectiveness. However, there was a paucity of tools to assess nursing students’ perceptions of these technologies. Therefore, this study aimed to translate and adapt the ‘Comprehensive Evaluation of Use of Technology in Education (CEUTIE) instrument, developed in a previous study, into Sinhala culture for use among the Sinhala-speaking nursing students in Sri Lanka, with the permission of its’ developers.

Methods: Cross-cultural adaptation of the Sinhala version of the CEUTIE instrument was done, following the phases according to the model, developed in a previous study. The content validity ratio and the content validity index were calculated before the pre-testing phase. As suggested by Beaton et al. (2000), pre-testing was done at the School of Nursing, Galle, by randomly selecting 31 nursing students. During the pretesting process, 31 students, were asked to categorize each questionnaire item on a dichotomous scale as ‘clear’ or ‘unclear’. Both meanings of items and responses were explored. The distribution of responses was evaluated for a high proportion of missing items and the repetition of single responses. Thereafter psychometric properties of the translated instrument were assessed by randomly selected another 200 nursing students from the School of Nursing, Galle, from June 2023 to July 2024. Only 152 (76%) nursing students responded and those responses were used for assessing the psychometric properties of the instrument. Internal consistency (Cronbach’s alpha value) and item correlations for each questionnaire item score with the total score were calculated for all responses of the respondents.

Results: Pre-final Sinhala version of the CEUTIE instrument received a maximum content validity ratio of 1.0 for all the items and a maximum content validity index for all individual items of 1.0. Cronbach's Alpha value for all 28 items in the instrument was 0.98. Correlations for each questionnaire item score with the total score were higher than the r table product moment of 0.16 ($p < 0.001$).

Conclusions: The cross-culturally adapted Sinhala version of the CEUTIE instrument was reliable and valid to use, for Sinhala-speaking nursing students in Sri Lanka.

Keywords: CEUTIE, Cross-cultural adaptation, Sinhala version, Nursing students

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Introduction

Due to the third wave of COVID-19 pandemic in Sri Lanka, all the universities and schools including, Nursing academic institutions were closed to implement social distancing guidelines, issued by the government of Sri Lanka (Rathnayake et al., 2022). Closure of the Nursing academic institutions negatively impacted Nursing education in Sri Lanka, with the acute shortage of nurses in the country (Rathnayake et al., 2022).

Before the COVID-19 pandemic, nursing education in Sri Lanka was conducted entirely through face-to-face classroom teaching (Rathnayake et al., 2022). However, during the pandemic, face-to-face teaching and learning strategies were shifted to online platforms to prevent the spread of infection (Rathnayake et al., 2022).

Due to technological advancements, several digital educational technologies are being increasingly used in educational institutions worldwide to enhance the teaching and learning process (Damascena et al., 2019). These include discussion forums, blogs, avatars, virtual scenarios, immersive technologies, video calls, web conferences, audio recordings, videos, slides, tutorials, image sharing, bibliography sharing, activities, tests, online schedules, mind maps or graphic organizers, file management systems, instant messaging, research tools, and social networks (Loureiro et al., 2021).

Nurse educators in Sri Lanka also used various E-learning platforms including Zoom, Microsoft Teams, Learning Management Systems, E-mails, and

WhatsApp messaging apps to continue education during this pandemic period (Rathnayake et al., 2022).

E-learning offers several advantages. It allows students to learn with greater flexibility and independence while helping them develop cognitive, technical, and critical thinking skills through engagement in e-learning activities. Additionally, it empowers teachers to enhance their personal and professional growth, as well as their technical skills (Kuriplachová et al., 2019).

However, the acquisition of clinical skills and competencies was challenged by the use of online teaching and learning strategies, as nursing is a highly practical discipline (Rathnayake et al., 2022). Other challenges associated with e-learning included limited opportunities for hands-on learning, difficulties in conducting online assessments, connectivity issues, feelings of isolation, and limited computer skills needed to engage in e-learning activities (Nuuyoma et al., 2023).

Considering the differences between face-to-face and virtual learning environments, it is essential to develop a new assessment model to evaluate the e-learning atmosphere as a timely necessity (Lee & Lee, 2008). Moreover, students' perception on these new models also equally important. However, there is limited evidence of students' perceptions of their experience with educational technologies (Clarke et al., 2001). Due to this limitation, various e-learning strategies were implemented in higher education institutions in Sri Lanka without evidence of students' acceptance of these methods (Yatigamma & Wijayarathna, 2021). Therefore, the

assessment regarding students' acceptance of E-learning pedagogies, is required to design their E-learning methodologies in teaching to achieve maxim outcomes. (Yatigammana & Wijayarathna, 2021). According to the present understanding, there was no comprehensive tool to evaluate the technologies used in education, across all dimensions in diverse learning environments (Lai et al., 2022). However, the "Comprehensive Evaluation of Use of Technology in Education" (CEUTIE) instrument supports holistic, comprehensive, and robust evaluation and comparison of used technologies, across all educational contexts in the world (Lai et al., 2022). The CEUTIE instrument has eight factors including learning outcome, affective elements, behavior, design, technology, teaching pedagogy, presence/ community, and institutional environment (Lai et al., 2022).

Given its comprehensiveness covering many aspects in teaching-learning process, this study aimed to adapt the CEUTIE, an instrument developed by Lai et al. 2022 into Sinhala culture by translating from source language to target language (Sinhala) for use among the Sinhala-speaking nursing students in Sri Lanka.

Methods

Description of the instrument

This eight-factor model of the CEUTIE instrument has been validated with the confirmatory factor analysis with; $\chi^2/df = 3.932$, NFI = 0.959, TLI = 0.964, CFI = 0.970, GFI = 0.940, RMSEA = 0.044 (Lai et al., 2022). In addition, all eight factors of the

instrument have shown Cronbach's alpha values above 0.7, hence the internal consistency of the items of the instrument was considered as good (Lai et al., 2022). Under the above-mentioned eight factors of the measurement instrument, there were 28 items on a seven points Likert scale, varying from 0 to 6. "0" represents the perception of the students as "Strongly Disagree, and the "6" represents the perception as "Strongly Agree", to the given statements (Lai et al., 2022).

Permission was received from the developers to cross-culturally adapt and use the CEUTIE instrument in Sri Lanka to evaluate Sinhala-speaking nursing students perception on educational technologies.

Process of cross-cultural adaptation

Cross-cultural adaptation was done by following the steps suggested by Beaton et al. (2000) including, translation, synthesis, back translation, expert committee review, and pretesting. Ethical approval for the study was received from the Ethics Review Committee, Kaatsu International University, Sri Lanka by letter No. KIU/ERC/23/041, on 05.05.2023. Institutional approval was taken from the Principal School of Nursing, Galle.

Translation

Beaton et al. (2000) suggested; making at least two forward translations from the source language to the target language. The CEUTIE instrument was published originally in English and needed to be translated into Sinhala. Two independent translators; whose mother tongue is Sinhala, translated the English version into Sinhala language. One

of the translators from those two was aware of the concepts being examined in the instrument, and the other translator was neither aware nor informed regarding the concepts of the instrument. Those two translators prepared two separate copies of the Sinhala translation of the original instrument during this phase.

Synthesis

In this phase, the above two translators collectively identified the discrepancies with their reports as suggested by Beaton et al. (2000). Thereafter, the two translators prepared a synthesized copy of the Sinhala language translation of the CEUTIE instrument, during this phase.

Back translation

In the back translation process, two new translators were involved. Those two translators were blind to the original English version of the CEUTIE instrument. The new translators created two English translations of the synthesized Sinhala version of the CEUTIE instrument, developed at the synthesis phase as suggested by Beaton et al. (2000).

Expert committee opinion

The composition of the expert committee was decided as suggested by Beaton et al. (2000). The three-member expert consisted of a Principal of a School of Nursing, a Senior nursing Tutor, and a graduate teacher. In this phase, the expert committee evaluated the translated questionnaire for content validity and consensual validity by using modified Delphi techniques. as described by Hecht

(1979). Three aspects were evaluated in this phase including; the appropriateness of each item of the Sinhala version, wording appropriateness of the Sinhala version by comparing the English version, and the cultural relevance of each item, relevant to the Sri Lankan context accordingly. The three-member panel marked their feedback for each item of the questionnaire as suggested by Lawshe (1975). Panelists of the expert committee rated each item of the instrument as 'essential', 'useful but not essential', and 'not necessary' as suggested by Lawshe (1975). Experts' feedback was taken for their ratings and reworded or modified the items that were underrated. Items that were rated as 'useful but not essential' and 'not necessary' by 50% of the panelists were reworded and modified. Those modified questionnaires were sent to the experts again to get their feedback and grading as described above. Three rounds Delphi process were applied to get a consensus evaluation of the experts.

The content validity ratio of the instrument was calculated according to the formula suggested by Lawshe (1975), before the pretesting. Items higher than the content validity ratio of 0.78 with three or more experts could be considered as evidence of good content validity and expected to be retained as suggested by Polit et al. (2007). The content validity index was calculated by obtaining the mean content validity ratio of all the items of the instrument, as suggested by DeVon et al. (2007).

Pretesting

Pretesting was conducted at the School of Nursing Galle, from May to June 2023. 31

randomly selected and voluntarily participated, nursing students were asked to categorize the Sinhala version of the CEUTIE instrument items on a dichotomous scale as 'clear' or 'unclear' as suggested by Sousa & Rojjanasrirat (2011). Each participant was evaluated regarding what he or she thought was meant by each instrument item and the chosen responses as suggested by Beaton et al. (2000). Both the meaning of the item and the responses were explored. The distribution of the responses was evaluated for the high proportion of missing items and the repetition of single responses as suggested by Beaton et al. (2000). This process ensured the face validity of the translated instrument (Beaton et al., 2000).

Evaluating the psychometric properties of the Sinhala version of the CEUTIE instrument.

Beaton et al. (2000) suggested evaluating the psychometric properties of the translated questionnaire by using a larger sample after doing a pretesting of an instrument. Some scholars recommended evaluating the psychometric properties of an instrument by using a sample, two to twenty times larger than the instrument items, with an absolute minimum of 100 – 250 participants (Anthoine et al., 2014). Accordingly, the evaluation of psychometric properties of the pre-tested Sinhala version of the CEUTIE instrument was performed at the School of Nursing, Galle, by sending the Google-based pre-final version of the instrument to randomly select 200 nursing students, from June to July 2023. The participants were informed of the study process by sharing emails. Informed consent was obtained from

all the participants. About 152 (76%) nursing students returned their answers and, used them for the final analysis. Answers were collected into a Google spreadsheet and converted into an MS Excel document. It was converted into an SPSS data sheet. Data was analyzed by using IBM SPSS V.25. Descriptive statistical techniques were used to calculate the overall mean values for each questionnaire item of the instrument. Demographic data were analyzed by using frequencies.

Cronbach's alpha value and the correlations for each questionnaire item score with the total scores were calculated for all responses of the respondents (n=152). Cronbach's alpha value was calculated for the originally loaded factor structure.

Results of the pre-test

Population characteristics and response frequencies

A total of 31 nursing students participated in the pre-test. This sample consisted of 4 male students and 27 female students. The highest overall mean value was reported for the 17th item in the questionnaire (5.29 SD±1.039). The lowest overall mean value was reported for the 25th item in the questionnaire (3.52 SD±1.93).

Frequency of understandability of the questionnaire items by the participants

Most of the time more than 87% of the participants (n=31) stated, that they were able to identify the meaning of the pre-final version of the instrument items, except in one occasion. The frequency of understandability

was reported as 83.9% for item number 14 as the lowest. There were no missing questions reported. Similar response patterns were not identified. The meaning of the instrument items and the responses of the participants were compared and they were matched with the meaning and the expected answers of the original version of the CEUTIE instrument.

Content validity ratio and content validity index

Three-member expert panel marked that, all the items in the pre-final version of the instrument as essential in their conclusion. Therefore, all the items of the pre-final Sinhala version of the CEUTIE instrument obtained a maximum content validity ratio of 1.0 for all the items and a maximum content validity index for all individual items as 1.0.

Results of the evaluation of the psychometric properties

Population characteristics and response frequencies

The sample mainly consisted of females (92.11%, n=140). The majority of the sample represented the age category of 25-28 years (67.76%, n=103). The most popular device used by nursing students to continue their E-learning activities was the 'Smartphone' (88.82%, n=135). Demographic data related to the participants were summarized in the following Table 1. The highest overall mean value was reported for the 19th item in the questionnaire. (4.6 SD±1.49). The lowest overall mean value was reported for the 25th item in the questionnaire (3.38 SD±1.87).

Reliability statistics

Cronbach's Alpha value for all 28 items in the pre-final version of the instrument was 0.98. It was closer to 0.1. Cronbach's alpha for all 8 constructs of the instrument exceeded the value of 0.90. Cronbach's alpha values for all 8 constructs of the instrument, loaded during the factor analysis, of the original instrument validation process are shown in Table 2. Independent factor analysis was not performed during this study process.

Pearson correlation values

Pearson correlation values, for each questionnaire item score with the total score, were higher than the r table product moment of 0.16 (significance level 5%, n=152, df=150). Significance values obtained for all 28 items were <0.05 (2-tailed).

Discussion

This study aimed to conduct a cross-cultural validation of CEUTIE; an instrument developed by Lai et al. in 2022 for the Sinhala cultural context for use among the Sinhala-speaking nursing students in Sri Lanka. All the items of the pre-final Sinhala version of the CEUTIE instrument obtained a maximum content validity ratio of 1.0 for all the items and a maximum content validity index for all individual items as 1.0. Polit et al., (2007) suggested, that the items with the content validity ratio of 0.78 or higher could be considered as having a good content validity. Furthermore, Davis (1992) suggested, that the items with a content validity index, exceeding 0.80 are preferred.

Therefore, all 28 items of the pre-final Sinhala version of the CEUTIE instrument could be considered evidence of good content validity.

Table 1: Demographic information of the participants (N=152)

Category	Frequency (n)	Percentage
Sex		
Male	12	7.89
Female	140	92.11
Age category		
18-24 Years	49	32.24
25-28 Years	103	67.76
Perceived digital dependency		
Low	11	7.24
Medium	99	65.13
High	42	27.63
Perceived digital competency		
Low	19	6.60
Medium	92	85.10
High	41	8.30
GCE A/L stream		
Biology	110	72.37
Combined maths	34	22.37
Agriculture	8	5.26
Completion of prior formal information technology course		
Completed	116	76.32
Not completed	36	23.68
Family support received for continued education		
Good	104	68.42
Fair	47	30.92
Poor	1	0.66
Used device for engaging E-learning activities		
Smart Phone	135	88.82
Laptop	8	5.26
Desktop	6	3.95
Tab	3	1.97

Table 2: Reliability statistics for all the constructs

The construct of the instrument	Cronbach's alpha	No. of items
Learning outcome	0.94	4
Affective elements	0.91	4
Behavior	0.90	3
Design	0.95	3
Technology	0.92	5
Teaching pedagogy	0.91	3
Presence/community	0.92	3
Institutional environment	0.92	3

During the pre-test, more than 87% of the participants (n=31) stated, that they were able to understand the meaning of the items in the pre-final version of the instrument except in one occasion. In line with the recommendation that re-evaluating items in a scale is not required if the inter-rater agreement on meanings of the items and responses is more than 80% (Sousa & Rojjanasrirat, 2011), and the psychometric properties of this instrument shown for this study sample (Cronbach's alpha values for all the variables of the instrument and the 8 constructs were > 0.90), it is understandable that no further development of the instrument needed (Cortina, 1993) and therefore this is a valued tool for this study population. Further, it is understandable, that the items of the translated instrument had a higher agreement between' items as suggested by Jugessur (2022). Higher Cronbach's alpha values indicated that the instrument had high internal consistency and reliability (Jugessur, 2022). Therefore, it was confirmed that the translated Sinhala version of the CEUTIE

instrument has good internal consistency and reliability. Correlations between each item score with the total score, were higher than the *r* table product moment, during the pre-testing phase. Significance values obtained for all 28 items were <0.05). Therefore, each item of the translated Sinhala version of the CEUTIE instrument could be considered valid. The original English version of the CEUTIE instrument was validated by Lai, et al. (2022), by using 1352 participants, undertaking an open online course in 2022.

Lai et al. (2022) reported Cronbach's alpha values for all the constructs, as more than 0.70, with good internal consistency. In the present study; the received Cronbach's alpha value, was higher than the original English version of the CEUTIE instrument. If the Cronbach's alpha value is too high may suggest, that some items in the instrument are redundant, as they are testing the same question, but in a different way (Tavakol & Dennick, 2011). In the pre-final Sinhala version of the CEUTIE instrument, items number 12 and 14 provided more similar

meanings for a superficial reader. This may create some effects on the overall Cronbach's alpha value of the Sinhala version of the CEUTIE instrument eventually.

Some scholars recommended conducting the psychometric properties assessment of an instrument by using a sample, two to twenty times larger than the instrument items, with an absolute minimum of 100 – 250 participants (Anthoine et al., 2014). Therefore, the expected maximum sample size was 560. However, in this study, the sample size was 152, because due to the poor response rate of the nursing students, School of Nursing, Galle. The sample size used to validate the Sinhala version of the CEUTIE instrument is very much lower than the sample used by Lai et al. in 2022. It could be a significant reason for the Cronbach's alpha value differences in those two occasions. Therefore, this was one of the limitations of the present study.

There may be several other factors also influenced the Cronbach's alpha value differences including the differences in the target group, differences in the setting, differences in the respondents' mood, and the regression effect of an instrument, in two different settings. In the present study, the reliability analysis was performed without doing any factor analysis. Reliability analysis was performed according to the eight factors loaded during the original instrument development phase by the original developers. That is a considerable limitation of the present study. The present study was limited to one setting. The male students' frequency of the sample was 7.89%. Therefore, the generalizability of the findings will be limited.

Conclusion

The findings of the study confirmed that the cross-culturally adapted Sinhala version of the CEUTIE instrument is a valid and reliable instrument to measure the self-perception regarding the usage of educational technologies in teaching, among the Sinhala speaking nursing students in Sri Lanka. It is recommended to assess the nursing students' perception regarding the used technologies in education, with many student population groups across the country using the translated version of the CEUTIE instrument. This will help upgrading E-learning techniques to deliver the traditional nursing curriculum on modern educational platforms in Sri Lanka.

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Conflict of interest

The authors declare that they have no conflict of interests.

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