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Developing the SVN CLEI; a novel psychometric instrument for evaluating the clinical learning environment of student veterinary nurses in the UK.

Primary Author
Susan L Holt[1]*
MRes B.Sc. (Hons) RVN PGCHE FHEA
Susan.holt@bristol.ac.uk*
Lecturer and Programme Tutor
Veterinary Nursing Department
Vet School
University of Bristol
Langford House
Langford
Bristol
BS40 5DU
07845215285
ORCID iD: 0000-0003-1911-8300

Second Author
Dr Mary Farrell[2]
PhD, B.Sc. (Hons) PGCHE SFHEA
Mary.farrell@cumbria.ac.uk
Lecturer, Zoology
Institute of Science, Natural Resources and Outdoor Studies
University of Cumbria
Fusehill St
Carlisle
CA1 2HH

Third Author
Dr Richard H Corrigan[3]
PhD, MA, MSc, PGDip, PGCE, BA, MBPsS
richard.corrigan@hartpury.ac.uk
Programme Manager MRes Anthrozoology
Hartpury University
Hartpury House
Hartpury
GL19 3BE

*Corresponding Author

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Abstract
Student Veterinary Nurses (SVNs) in the United Kingdom can spend over half their training time within the clinical learning environment (CLE) of a training veterinary practice before achieving clinical competency. Socio-cultural complexities and poor management within the CLE may have a significant impact on the learning experiences of SVNs, as has been found in studies involving student human nurses. The aim of this research was to develop and validate an SVN CLE Inventory (CLEI), using Principal Component Analysis (PCA), via a cross-sectional design, based on inventories already established in human nursing CLEs. The SVN CLEI was distributed to SVNs via an online survey over a three-month period, which generated 271 responses. PCA resulted in a valid and reliable SVN CLEI with 25 Items across three Factors with a total variance explained of 61.004% and an overall Cronbach Alpha of 0.953. (Factor 1, Clinical Supervisor Support of Learning (α=0.935), Factor 2, Pedagogical Atmosphere of the Practice (α=0.924) and Factor 3, Opportunities for Engagement (α=0.698)). Gaining student feedback is a requirement set out by the Royal College of Veterinary Surgeons Standards Framework for Student Veterinary Nurse Education and Training, and the SVN CLEI can be used to complement the current evaluation of the training veterinary practice CLE. This will facilitate development towards a more comparable, consistent, and positive experience for SVNs during clinical training in the UK.

Introduction
In the United Kingdom (UK), student veterinary nurse (SVN) training requires completion of theoretical and practical elements that must total at least 2990 hours.[1] This must include at least 1800 hours working within a veterinary training practice (TP) that has been approved by a Royal College of Veterinary Surgeons (RCVS) accredited education institution (AEI).[2] Therefore, the SVN can spend more than half their training time in the clinical learning environment (CLE) of a veterinary practice. To become a TP, a veterinary practice must meet specific requirements relating to physical and human resources and clinical caseload.[2] These aspects are tangible and easy to evaluate during an AEI internal quality assurer (IQA) approval visit, using a visit check form. These forms may vary slightly between AEIs but all will check systematically through the RCVS TP requirements.[2] Within the CLE, SVNs are assigned a single Clinical Supervisor (CS) who will be a veterinary surgeon or Registered Veterinary Nurse (RVN), who has undergone training for the supervisory role.[2]

The experiences a student has in the CLE are critical in preparing student human nurses (SHNs) for their career, allowing opportunities to put theory into practice, develop clinical skills, and build professional identity and confidence.[3–6] Whilst no such research for SVNs could be identified, the two professions' practical training can be considered comparable. This is evidenced by the RCVS Standards Framework for Veterinary Nurse Education and Training, which adopted the structure and format of the Nursing and Midwifery Council Standards of Proficiency for Registered Nurses.[2] Therefore, the veterinary nursing profession must currently look to the literature available in SHN experiences of the CLE to help identify areas for research and development.

The supervisory relationship SHNs have in the CLE has been cited as the most influential factor in determining student satisfaction levels.[3,5,7] Studies have found that poor clinical supervision of SHNs has negative impacts such as disorganisation, lack

of appropriate feedback, lack of teaching innovation and personalisation towards individual students learning requirements.[3,4,8] Inadequate CS practice can also cause confusion in student expectations and professional identity, especially when they are inappropriate role models and express negative attitudes towards their own career.[9] This evidence demonstrates that there can be poor support provided by some supervisors, which is detrimental for SHN training and development.[3,4,8,9]

A pedagogically supportive and friendly environment is vital in ensuring quality teaching and learning outcomes,[10,11] however, SHNs have reported that the CLE they experience does not always match the positive environment they would favour.[11] First experiences within a CLE will be a daunting prospect for most, and has been reported to create anticipatory fear in SHNs.[8,12] The wider professional staff, who are present in the CLE alongside SHNs, can also affect the learning experience.[3] An unsupportive atmosphere among the team leading to poor relationships, including negative attitudes to the presence of SHNs has also been found to cause feelings of inferiority. [10,12] In addition, environmental factors such as a busy workload and too many students on the ward have also been reported by SHNs.[3,4,13] Failure to identify and address student concerns within the SHN CLE can lead to a decrease in professional growth and development.[9]

The negative impacts of a poor CLE can include reduced learning opportunities and confidence, poor mental health and dissatisfaction among SHNs, leading to increased attrition.[3,13–15] It is important to ensure that the CLE is managed positively to build confidence and encourage SHN engagement with learning opportunities.[15] Global research involving a range of health profession training environments has shown that identifying areas of concern can lead to the development of appropriate improvement strategies.[11,16,17] These have included changes to communication and feedback in the CS curriculum,[16] and improved working relationships between the student, CS and educational provider.[17,18] Therefore, gaining insight into the student perspective and satisfaction of learning opportunities within the SVN CLE would be beneficial.

Currently there is a lack of available research investigating the SVN satisfaction and experiences with the CLE. Although individual AEIs may gather SVN CLE feedback, this is not systematically collected and may not be universally applicable. Therefore, it was considered prudent to develop an instrument to allow systematic evaluation of the SVN experience of the CLE. This will allow appropriate research to be conducted using a validated tool, which will highlight areas of concern and best practice for TPs. In turn, this will serve to develop and improve the SVN clinical training experience in the UK.

Materials and Methods

A cross-sectional design was achieved using a self-administered psychometric instrument, the novel SVN CLE Inventory (CLEI), to evaluate the perception of SVNs regarding the veterinary CLE. In an email from J. Dugmore, (Director of Veterinary Nursing, RCVS), on 5th November 2020, the total number of SVNs enrolled with the RCVS was confirmed to be 6,326 as of 2nd November 2020.

SVN CLEI Design

There have been at least five original instruments developed and used with SHNs to evaluate the CLE.[19–23] Some later instruments reported are adaptations of these early versions.[13,24–26] Overall, all of these instruments contain similar Factors, such as staff-

student relationships, students feeling “included” and “atmosphere”, with only slight variation in Items due to language and training differences in the countries of origin.[27] Additional Factors have also been included in some versions to account for other teaching roles in the SHN CLE such as “preceptor” or “ward manager”.[23] Three empirical studies’ instruments were identified as containing Items that would be appropriate to adapt for creating the SVN CLEI due to their close relevance to the SVN clinical training context, as detailed within the RCVS Standards Framework for Veterinary Nurse Education and Training 2021 (see Table 1).[13,24,28] These studies not only reported all the Factors and Items of the instruments utilised, but also included the Cronbach’s Alpha and Factor Analysis results, detailing the level of validity and reliability of the instruments, further supporting their selection. Permission was received from J. M. Weller-Newton to use the Items from the modified CLEI.

Table 1: Empirical studies used for development of the SVN CLEI

Adaptations were made to account for the differences between the SHN and SVN CLE. Items and Factors in the original instruments that related to nurse teachers, ward managers, ward nurses and staff nurses were not utilised due to their redundancy in the SVN CLE. Factors relating to the socio-cultural elements of the CLE, can be the most influential factors affecting SHNs satisfaction with the CLE.[3,13,14,29] In SHN instruments, the three common factors of staff-student relationships, students feeling “included” and “atmosphere” were the focus of the development of an appropriate SVN CLEI.

Factor 1 – Clinical Supervisor Support of Learning
This Factor is aimed at assessing the student perspective of the relationship with their assigned CS and a total of 13 Items were selected (see Table 2). Adaptations were made to wording to change the terms used in SHN to denote managers and supervisors to “clinical supervisor” which is the appropriate term in SVN training.[2] In addition, the questions were also modified to more accurately capture the personal perceptions and experiences of the individual SVN.

Table 2: SVN CLEI adaptations from original Items and Factors used for Factor One: Clinical Supervisor Support of Learning (negatively worded Items are recorded in italics)

Factor 2 – Pedagogical Atmosphere in the Practice
This Factor is aimed at capturing the ability of the veterinary practice to provide a conducive learning and teaching environment appropriate for SVN training and development. Ten Items were selected to represent this Factor (see Table 3). Again, there were slight changes made to the wording across these Items to ensure the students would reflect on their own experiences, rather than those of fellow students. The term “ward” was also changed to “practice” as this is more relevant to the SVN CLE. In addition, questions 16 and 17 were adapted to differentiate between the clinical team and support staff in the veterinary practice.

Table 3: SVN CLEI adaptations from original Items and Factors used for Factor 2: Pedagogical Atmosphere in the Practice (negatively worded Items are recorded in italics.

Factor 3 – Student Satisfaction
These Items are aimed at capturing the general perception of the student towards their clinical environment and how it makes them feel. Six Items were selected to capture this Factor (see Table 4). The same principles were applied here as for the previous two Factors utilising "personal experiences" and "practice" rather than "ward" terminology.

Table 4: SVN CLEI adaptations from original Items and Factors used for Factor 3: Student Satisfaction (negatively worded Items are recorded in italics).

The SVN CLEI
The combination of the above three Factors resulted in a self-report instrument comprising of 29 positively (*n*=23) or negatively (*n*=6) worded, 5-point Likert Items. A 5-point Likert scale (1 = Strongly Agree to 5 = Strongly Disagree) was selected as it is a commonly used scale in social sciences.[30] Using a balance of positively and negatively worded Items reduces response set bias and was therefore considered suitable for this study.[31] Before proceeding to the SVN CLEI five demographical domains were surveyed including Student Status (full time or work-based), Pathway (equine or small animal), Region, Practice Type (equine, small animal, or equine and small animal (mixed) and Time Spent in Current Practice.

Sampling and Participants
The survey was generated using the survey tool Online Surveys (Jisc® Online Surveys, Bristol, BS1 6NB UK, onlinesurveys.ac.uk) and was available between 31/10/2020 and 31/01/2021. Items were randomly ordered, not grouped or labelled by Factor to reduce response bias.[24] Non-random convenience and snowball sampling of SVNs was achieved through five Facebook® sites, specific to the VN profession such as "VetNurse Chatter", alongside email contact with VN course providers and practice groups across the UK. The British Veterinary Nursing Association (BVNA) also shared the survey on their website, Facebook® and Twitter® sites throughout December 2020. Non-random, convenience sampling is widely used in research as it is quick, inexpensive and convenient and allows the researcher easy access to the sample population.[32] Snowball sampling allows an increase of participants for researchers by asking professional contacts and respondents to share the study with appropriate acquaintances that fit the criteria.[33] Inclusion criteria restricted participants to current UK based SVNs, who had spent at least eight weeks in a CLE, to ensure they had enough time to develop informed opinions about their experiences. Students that had spent time in more than one veterinary practice were asked to answer based on their most recent practice experience of eight weeks or more. This was to ensure that the views provided were the most recent, rather than more historical experiences, which may be difficult to recall accurately. The aim was for a sample size above 150 for reliable Factor Analysis.[34]

Ethical Considerations
Ethical approval for this study was granted from Hartpury University Ethics Committee (ETHICS2020-18-LR). Participation was voluntary, anonymous and informed consent was gained. A closing statement provided contact details for any student who was experiencing concerns with their CLE and required support.

Data Analysis

Frequencies were reported within demographical data relating to SVN respondents. Data were analysed using the Statistical Package for Social Sciences version 26.0 (SPSS Inc., Chicago, IL, USA). Kaiser-Meyer-Olkin index (KMO) (required minimum value of 0.60), and Bartlett's test of sphericity (significance set at $p<0.05$) were included to evaluate the strength of inter-correlations among the Items and determine if Factor Analysis was appropriate.[34] The 29 Item SVN-CLEI was then analysed using Principal Component Analysis (PCA). The PCA was run without any Factor constraints, a Varimax rotation was applied with Kaiser normalisation. Appropriate adjustments to the Inventory were made following the initial PCA, the process was repeated to determine the final Inventory. Eigenvalues were required at >1.0 and percentage of variance explained required at >60%. Loadings of <0.4 were suppressed. Internal reliability for the total scale and each Factor were analysed using Cronbach's Alpha. Examples of Alpha scores described in science journals have been reported as follows; excellent (0.93-0.94), strong (0.91-0.93), reliable (0.84-0.90), reasonable (0.67-0.87), adequate (0.64-0.85). [35] Scores above 0.70 are considered to show good reliability.[34,36] The effect of the Alpha score if Items were removed was also considered. Items were removed if they did not meet the required threshold and the analysis was repeated to build and validate the final Inventory. Any changes required to Factor structure following PCA and reliability testing was considered and rigorously discussed by the research team, in line with appropriate consideration of the emerging Factor loadings.

Results

A total of 271 SVNs completed the survey in full and no submissions needed to be excluded.

Demographics

There was an even divide between full time students (*n*=135;49.82%) and work-based students (*n*=136;50.18%). There were more small animal students (*n*=263;97%) represented than equine students (n=8;3%). Most students were working in small animal practice (*n*=246;90.77%). Most students had spent over 12 months in their current practice (*n*=162;59.78%). The SouthWest region had the largest single representation of respondents with 29.5% (*n*=80). Complete frequencies across the five demographic domains are presented in Table 5 and Figure 1.

Table 5: Respondent related demographics

Figure 1: Geographical spread of respondents' practices

Tests of Adequacy for PCA

Bartlett's test of sphericity was found to be highly significant ($p<0.001$) and the Kaiser-Meyer-Olkin measure of sampling adequacy was found to be superb (0.944). These measures indicated PCA was highly appropriate for the data set.

PCA and Cronbach's Alpha

The primary PCA produced a 5-Factor solution with 63.85% of the total variance explained. Most Items loaded onto Factors 1 and 2 and only two Items on Factor 5.

Cronbach's Alpha test of internal validity ($\alpha=0.948$) was excellent. Items 1 and 9 were highly correlated (0.838). Reviewing the highly correlated Items 1 and 9, Item 1 was

chosen for deletion over Item 9 as it was considered that the wording “interesting”, rather than “innovative”, would be a more relevant assessment by the students; if they found the activity interesting, this would demonstrate support of their learning and encourage engagement.

Items 8, 11 and 18, poorly correlated with all other Items (<0.3). Removal of Items 8 and 11 in Factor 1, resulted in higher Cronbach’s Alpha scores from 0.914 to 0.924 and 0.929, respectively. Removal of Item 18 from Factor 2 also resulted in a higher Cronbach Alpha from 0.850 to 0.863. Therefore, Items 8, 11 and 18 were removed.

PCA was repeated following removal of the four Items detailed above. The results produced a solution with 25 Items across three Factors explaining a total of 61.004% of the variance (see Table 6). Cronbach’s Alpha for the total scale was excellent at 0.953. Final Factor labelling was rigorously discussed by the research team until a consensus was achieved. A description of each new Factor is detailed below.

Table 6: The final SVN CLEI: PCA Factor loadings (negatively worded Items are shown in italics). Loading of all Factors above 0.400 are shown.

Factor 1 – Clinical Supervisor Support of Learning
This Factor was retained with 10 Items (following the omission of Items 1, 8 and 11 as previously described). The remaining Items all still related directly to the CS with the wording “my clinical supervisor” contained in all Items, so this was considered a highly appropriate decision.

Factor 2 – Pedagogical Atmosphere in the Practice
Following the removal of Item 18, a review of the new Items now loading onto this Factor was conducted. 12 Items now adequately loaded on this Factor, and as all were considered to contribute to the overall pedagogical atmosphere of the practice for student clinical learning the original title was retained. Original Items 16, 20 and 23 were removed, as they loaded onto Factor 3. Additional Items loaded on to Factor 2 were 24-29. These were originally placed in Factor 3, prior to PCA.

Factor 3 – Opportunities for Engagement
A review of the 3 Items loading onto Factor 3, 16, 20 and 23, led to a change of title, from the original “Student Satisfaction” to “Opportunities for Engagement”. This was because these Items were not adequately encompassed by the original title. The ability of the student to approach staff, offer opinions and feel able to take part in staff meetings, all relate to their opportunities to engage in learning within the CLE and therefore, the new title was more appropriate.

SVN CLEI Scoring
Factor 1 has a range of 10-50, Factor 2 has a range of 12-60 and Factor 3 a range of 3-15. All negatively worded Items are reverse scored. See Appendix 1 for final version of SVN CLEI.

Discussion

The SVN CLEI, was derived from a heterogenous sample of UK-based SVNs and TPs. Therefore, it accounted for the usual variance in learning between different students and TPs, making it appropriate for use across the UK.[24] There are substantially less equine practices and equine course places than small animal in the UK, which is

evident in the RCVS lists of approved courses and TPs.[37–39] The proportion of equine practices and equine students represented in the study is in line with their market share. The sampled population (*n*=271) represented 4.28% of the total population (*n*=6,326). The number of respondents is considered appropriate for robust PCA in development of a reliable instrument.[34,36]

To develop the final SVN CLEI, following the initial PCA, four Items were chosen for removal. Item 1 was too highly correlated to Item 9. The terms 'innovative' (Item 1) and 'interesting' (Item 9) were considered in relation to a student's level of understanding. It could be argued that a student may be unable to identify innovative activities when learning, as all activities may seem 'innovative' to the student. Therefore, a measure of 'interesting' was deemed more appropriate for a student to evaluate and Item 9 was kept and Item 1 removed. Items 8,11 and 18 were removed as they did not correlate to the other Items, and all resulted in higher Cronbach's Alpha scores if removed. Item 8, "I seldom work alongside my clinical supervisor in practice", was removed because the CS may not have the ability to determine the time they spend with their students, as they may not have responsibility for the staff rota. Therefore, this Item was inappropriate for inclusion in Factor 1. With regard to Item 11, "My clinical supervisor dominates my tutorial sessions", it is possible that student respondents varied in their interpretation of this statement. Some may have felt this was a positive aspect, whilst others may have felt this was negative, and this may have reduced the correlation with other Items in Factor 1. Item 11 was also covered by other questions in Factor 1, such as Item 4, "My Clinical Supervisor talks rather than listens", so the removal of this Item did not detract from the overall evaluation of the Clinical Supervisor. When practising evidence-based nursing, new concepts and ideas may well be incorporated in the experiences of the student without the student's awareness of this [40]. Therefore, Item 18 "New concepts and ideas in nursing are seldom tried out in this practice", was removed from Factor 2. The final SVN CLEI consists of 25 Items, in line with instruments seen in human nursing of between 19-42 Items.[13,24,25,28] The Cronbach's Alpha scores, total variance explained and Factor loadings of the SVN CLEI are all acceptable in scientific literature and in line with previously published instruments in human nursing.[13,24,25,28] All the final Factors include at least one reverse scored Item (negatively worded), which will reduce response set bias in future use.[24] Scoring the SVN CLEI can result in a range from 25-125, with higher scores indicating a better overall CLE experience from the subjective experience of the student.

Strengths

It is evident that this tool will complement the checks already made in assessing the CLE of SVNs in the UK, to create a holistic evaluation of the TP ability to provide high quality SVN training. Although these visit forms systematically check through the RCVS TP requirements,[2] it is also vital to fully assess the socio-cultural nuances of the practice as perceived by the student.[5,25] The CS-student relationship, wider pedagogical atmosphere, and opportunities for engagement, will have a significant impact on the students' learning experience overall,[11,12,41–43] and have therefore been included in the SVN CLEI. A recent study demonstrated that some SVN CSs felt unprepared for the role following initial supervisor training.[44] In addition to this, a recent survey undertaken by the RCVS Mind Matters Initiative indicates that vet nurse graduates feel incivility is a serious problem in the profession. This further supports the need to assess the socio-cultural elements of the SVN CLE from the student perspective.[45]

There is no reason to doubt that challenges experienced and reported by SHNs in the CLE will be directly applicable to SVNs within a CLE. The use of the SVN CLEI, in conjunction with the standard TP visit form, will provide comprehensive, measurable, and comparable feedback of the student experience. It will also address many criteria set out in the RCVS Standards Framework for Veterinary Nurse Education and Training relating to gathering student feedback, including points, 1.9b, 1.10e, 1.11c, 2.14b, 3.13d, 3.15f, 4.1c, 4.5a, 4.7h, 5.8d, 6.3e.[2] It is suggested by the authors that the completed form is not shared with the practice, to protect the individual student and encourage open and honest responses, without fear of reprisal. However, it can be used to help the IQA form a complete picture from which to highlight any commendations or actions to the CS and TP to improve training experiences in the CLE. Using a reliable and validated tool to provide feedback for those involved in clinical teaching has been shown to be instrumental in driving change and improvement.[19–23]

Limitations

Selection bias was inherent in this study design, with the use of convenience sampling relying on those who volunteered to participate. This also created a greater response from the South West Region, as this is where the research team is located. The application of the SVN CLEI in veterinary nurse training outside the UK should be conducted with caution, as there may be variations in the CLE setting in other countries which may affect the reliability and validity of the instrument.

Future research

Now that the final Inventory has been established, it would be prudent to conduct a study UK-wide that incorporates the instrument and evaluates the SVN experience in the CLE. The impact of additional demographic domains could also be considered alongside a qualitative, open-question element, asking SVNs to state what they felt enhanced or detracted from their learning experiences in the CLEI. This would offer further insight into areas of commendation and areas in need of improvement. The SVN CLEI could be used as part of a longitudinal qualitative study involving a group of practices to investigate the effect of implementing this extra dimension of evaluation alongside the practice visit form. Developing a questionnaire to evaluate the experience of CSs working in TPs may also prove useful in assessing the support required for this role.

Conclusion

To ensure high quality CLEs for SVNs requires critical evaluation and regular assessment to drive appropriate change and improvement. There are multiple factors that can affect the CLE and gaining insight into all of them is prudent to ensure full evaluation with appropriate feedback. Whilst the physical resources and caseload are evaluated within the IQA visit of TPs in the UK, there was no extant standard tool for gathering SVN feedback of the socio-cultural complexities of the CLE.

The SVN CLEI developed here has shown an acceptable level of reliability and validity during PCA, in line with similar published instruments. [13,24,25,28] Therefore this Inventory can be considered acceptable to measure the student perception of the socio-cultural aspects of the CLE, including supervisor-student relationship, pedagogical atmosphere, and opportunities for engagement. The new Inventory can be used by AEIs to gain valuable insight into student perceptions and satisfaction with

their clinical training. This will complement the TP visit form currently used by IQAs and also cover specific requirements for student feedback outlined in the RCVS Standards Framework for Veterinary Nurse Education and Training. The SVN CLEI is currently only recommended for use in UK TPs.

Next steps will be to utilise the instrument to capture the experiences of SVNs in the CLE, evaluate the impact of its use and identify any predicting Factors for SVN CLEI scores.

Conflicts of Interest

This study was undertaken as part of the primary (SH) author's completion of the Master's in Research Programme at Hartpury University. The authors declare that they have no competing interests, and the study was self-funded.

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Figure Captions

Figure 1: Geographical location of respondent's training practices

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