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Evaluating student learning outcomes in oral health knowledge and skills

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Aims and objectives: To evaluate whether a set of oral health resources designed for workforce training was relevant for students undertaking an entry-level nursing or aged care qualification.

Background: Oral health is one of the most neglected aspects of nursing care experienced by older people. Despite efforts to improve aged care worker oral health knowledge and skills, one-off training and rapid staff turnover have hindered the success of workplace programmes. Inadequate oral health content in entry-level nursing and aged care qualifications has perpetuated this.

Design: Kirkpatrick's training and evaluation model was used to evaluate the resources developed by a project called Building Better Oral Health Communities. Students used them as prescribed study materials and completed pre- and postintervention questionnaires. Educators were interviewed to obtain their feedback. Quantitative data were analysed using descriptive and inferential statistics. Qualitative data were collated according to relevance to learning, presentation style and interest.

Results: Evaluation showed high levels of student and educator satisfaction. Student learning outcomes demonstrated consistently positive attitudes and significant self-reported improvements in oral health knowledge and skills. Irrespective of course type, students gained similar levels of oral health knowledge and skills following use of the resources.

Conclusion: Nurses and care workers must be able to provide consistent standards of oral health care as a fundamental part of caring for patients. Validated as an effective learning and teaching package, it is recommended that these resources be used to strengthen the oral health content of entry-level nursing and aged care qualifications.

Relevance to clinical practice: Building the oral health capacity of nurses and care workers is one way of reversing oral health neglect and improving the quality of care provided to older people.

KEYWORDS
aged care, care worker training, fundamental care, nurse education, older people, oral health

1 | INTRODUCTION

As a low-cost fundamental intervention, daily oral health care offers older people maximum benefits in terms of improved quality of life, lower risk of serious health conditions (such as malnutrition, poor diabetic control, aspiration pneumonia and bacteraemia) and lower incidence of unnecessary suffering, hospitalisation and/or premature death (Sloane et al., 2013; Terpenning & Shay, 2002; Thorne, Kazanjian, & MacEntee, 2001). Given the 1960s claim by the highly respected nurse theorist, Virginia Henderson, that the quality of nursing care could be judged by the condition of a person's mouth (Henderson, 1960; cited in Coleman, 2002, p. 193), it is disturbing that oral health has been described as one of the most neglected aspects of nursing care experienced by older people (Chalmers & Pearson, 2005; Coker, Pleog, Kaasalainen, & Cater, 2016; Miegel & Wachtel, 2009).

What does this paper contribute to the wider global community?

- It recognises the importance of oral health as a fundamental of care and that there is a great need to improve the standard of nursing care provided to older people.
- It highlights a need to strengthen the oral health content of entry-level nursing and aged care qualifications and encourages educators to use validated oral health learning and teaching resources and engage in interdisciplinary education.
- It raises the awareness that, irrespective of scopes of practice, nurses and care workers must be able to provide consistent standards of oral health care.

2 | BACKGROUND

2.1 | Oral health neglect

Contrary to their valuing oral health as one of the fundamentals of care (Coker et al., 2016; Kitson, Muntlin Athlin, & Conroy, 2014), it is widely recognised that nurses and care workers dismiss it as a low priority (Knevel, Foley, Gussy, & Karimi, 2016; McNally et al., 2012; Sloane et al., 2013; Wårdh, Berggren, Anderson, & Sörensen, 2002). The main assumptions justifying oral health neglect of older people include rationalising it as the dental profession's responsibility, assuming poor oral health is a normal part of ageing, and likening it to an optional grooming task (de Lugt-Lustig et al., 2014; Wårdh, Jonsson, & Wikstrom, 2012). Failure by care facilities to supply essential resources (such as toothbrushes and toothpastes) is symptomatic of this (Coleman & Watson, 2006; Dharamsi, Jivani, Dean, & Wyatt, 2009). Oral health's low-priority status is also evident by its absence in care plans; alternatively, when it is included, it is not considered mandatory (Coker et al., 2016; Miegel & Wachtel, 2009). Rigid routines, time-rationed workloads and staffing shortages perpetuate this by forcing care to be delivered in a task and time manner according to its perceived level of importance (Chami et al., 2016; Coker et al., 2016; Kitson et al., 2014).

Other reasons for nurse and care worker noncompliance include a lack of confidence or unreliable assumptions about the efficacy of their own oral health standards (which are unlikely to be evidence-based practice for older people); reluctance due to their own dental anxieties; fear of being bitten or hurting older people who exhibit care-resistant behaviours; and the perception that intraoral care is an invasion of privacy (Chalmers & Pearson, 2005; Hoben et al., 2016; Jablonski, Theerrien, & Kolanowski, 2011; McNally et al., 2012; Miegel & Wachtel, 2009). Most disturbing is the ubiquitous negativity attributed to oral health care (Hopcraft, Morgan, Satur, Wright, & Darby, 2010; Janssens et al., 2016; Knevel et al., 2016; Sloane et al., 2013), with some nurses and care workers openly admitting they would rather clean up an incident of incontinence than brush older people's teeth (Dharamsi et al., 2009; Unfer, Braun, de Oliveira Ferreira, Raut, & Batista, 2011).

2.2 | Oral health knowledge and skill gap

A lack of appropriate oral health knowledge, skills and insight into the high-risk consequences of poor oral health by nurses and care workers has been cited as contributing to oral health neglect (Chalmers & Pearson, 2005; De Visschere et al., 2015; Knevel et al., 2016; Miegel & Wachtel, 2009; Smith & Thomson, 2017). Regardless of whether it is nurse-led assessment and planning, or care delivery delegated to care workers, the impact of a rapidly ageing population—coupled with the complexity of older people's mouths (such as greater retention of natural teeth, crowns, bridge-work, partial dentures and implants)—will place greater demands on the need for effective oral health care (Forsell, Sjögren et al., 2011; Wårdh et al., 2002). Despite concerted efforts to implement a range of aged care oral health training programmes and/or toolkits (Fricker & Lewis, 2009; McNally et al., 2012; Miegel & Wachtel, 2009; Zimmerman, Sloane, Cohen, & Barrick, 2014), their long-term effectiveness has been hindered by one-off training compromised by rapid staff turnover, budget restrictions and time pressures (Wårdh et al., 2012; Weening-Verbree, Huisman-de Waal, van Achterberg, & Schoonhoven, 2013). Similarly, inadequate oral health content in nursing and care worker training curricula has been cited as perpetuating oral healthcare neglect (Fitzpatrick, 2000; Forsell, Kullberg, Hoogtraate, Johansson, & Sjögren, 2011; Hopcraft et al., 2010; Unfer et al., 2011). Noting the difficulties in sustaining workplace training, an alternative approach to instilling oral health as one of the fundamentals of care would be to strengthen the oral health content of entry-level nursing and aged care qualifications (Hahn, FitzGerald, Markham, Glassmand, & Guenther, 2012).

A recent Australian Government-funded project called Building Better Oral Health Communities (2012–2014) developed a suite of cost-free online learning and teaching resources designed to build the oral health capacity of the aged care workforce (Lewis, Kitson, & Harvey, 2016). The project found that nurses and care workers were highly positive about the oral health education provided, with subsequent care outcomes demonstrating improvements in older people's

oral health. Accordingly, the aim of this study was to evaluate the relevance of these resources for three different student groups which are yet to enter the aged care workforce. These groups included students undertaking a Bachelor of Nursing (BN) to become a registered nurse; students undertaking a Diploma of Nursing (EN) to become an enrolled nurse; and students undertaking a Certificate III Aged Care qualification (Cert III) to become an aged care worker. The objectives were to evaluate whether students found the resources relevant to their learning needs; whether the resources increased the oral health knowledge and skills of students; and whether the educators teaching these students found the resources to be relevant to the teaching of oral health as one of the fundamentals of care.

3 | METHOD

3.1 | Ethical consideration

Ethics approval (number H2016-024) was granted by the University of Adelaide Human Research Ethics Committee.

3.2 | Study design

The evaluation study took place from June–December 2016 and involved the university and vocational education sectors. The study design was based on Kirkpatrick's Model of learning and training evaluation. This approach is a recognised training industry standard, which has been widely applied across the health sector (Bates, 2004; Beech & Leather, 2006). As described in Table 1, the model identifies four levels at which to evaluate training or educational innovations. Level one evaluation refers to the participants' reaction to the training and considers their subjective opinions about what they liked or disliked about the training programme (Barr, Hammick, Koppel, & Reeves, 1999; Bates, 2004; Beech & Leather, 2006; Curran & Fleet, 2005; Sargent et al., 2011). This level gauges the interest of participants and is measured as satisfaction with regard to specific components of the training, such as relevance to learning needs, and presentation style (Curran & Fleet, 2005; Smidt, Balandin, Sigafoos, & Reed, 2009). Level two evaluation involves measuring whether learning has taken place in terms of participants' knowledge and/or skills (Barr et al., 1999; Bates, 2004; Beech & Leather, 2006; Curran & Fleet, 2005; Sargent et al., 2011; Smidt et al., 2009). Level three evaluation addresses the extent to which the knowledge and skills gained through the training have been applied in practice (Barr et al., 1999; Bates, 2004; Beech & Leather, 2006; Curran & Fleet, 2005; Sargent et al., 2011; Smidt et al., 2009). Level four evaluation describes the results of the training, measuring improvements in care and patient outcomes (Barr et al., 1999; Bates, 2004; O'Malley, Perdue, & Petracca, 2013; Sargent et al., 2011). While the outcome measurements from each level are not necessarily hierarchical, they are considered a useful starting point for comprehensive evaluation approaches to better inform policy and development (Hammick, Freeth, Kopple, Reeves, & Barr, 2007). For the purposes of this study, only levels 1 and 2 were evaluated because it was recognised that the monitoring of levels 3 and 4 would need to take place over a longer period and could be influenced by factors other than training (Beech & Leather, 2006; Curran & Fleet, 2005; Hammick et al., 2007; Smidt et al., 2009).

TABLE 1 The Kirkpatrick training and learning evaluation model

Level 1	Reaction	Learner satisfaction
Level 2	Learning	Learning outcomes (knowledge and skills)
Level 3	Behaviour	Performance improvement (transfer of learning to workplace)
Level 4	Results	Patient or healthcare outcomes

Source: Curran and Fleet (2005, p. 563) and Sargent et al. (2011, p. 169).

Prior to commencing the study, course coordinators identified what course or unit of competency (which included a clinical placement in aged care) would be most appropriate for the evaluation of the resources. Subsequently, participants were invited to join the study if they were a BN student undertaking a course of study called "health assessment and clinical nursing," a EN student undertaking a personal care unit of competency called "contribution to client assessment and development of a nursing care plan" or a Certificate III Aged Care student undertaking a personal care unit of competency called "providing support to meet personal care." Educators teaching these students were also invited to participate.

Students used the Building Better Oral Health Communities resources as prescribed study materials. They were directed to the following website (www.sahealth.sa.gov.au/OralHealthForOlderPeople) via their student/course communication platform (such as Blackboard or Moodle) and were instructed to complete five topics during the course or unit of competency. Topic 1 "better oral health care" covered factors contributing to poor oral health and its consequences on an older person's quality of life and well-being. Topic 2 "dementia and oral care" reviewed techniques in how to encourage participation in oral care and avoid care-resistant behaviours. Topic 3 "understanding the mouth" studied issues of acid attack on teeth, tooth-friendly eating, the implications of dry mouth, prevention of gum disease, oral health assessment, care planning and dental

TABLE 2 Student age, gender, country of birth and past experience as personal carer, by course

Variable	Bachelor of nursing (*N* = 41)	Diploma of nursing (*N* = 66)	Certificate III aged care (*N* = 17)
Age: Median (IQR)	20 (19.0, 21.8)	28 (20.5, 34.5)	34 (24.0, 42.0)
Gender (Female-*N* [%])	39 (95)	54 (82)	16 (94)
Country of birth (Born in Australia—*N* [%])	37 (90)	39 (59)	13 (77)
Experience as a personal carer (Yes-*N* [%])	18 (22)	32 (24)	6 (18)

TABLE 3 Student gender, country of birth and previous experience as a personal carer, by course

Variables	*p* Value
Course and gender	.098 (Fisher's exact test)
Course and country of birth	**.001** (Fisher's exact test)
Course and previous experience as a personal carer	.839 (Pearson chi-square)

Bold text indicates statistical significance with a *p* value of <.05.

referral pathways. Topic 4 "care of natural teeth" provided instructional information on toothbrushing techniques, including positioning of people dependent on care (e.g., the use of a cradle-hold technique routinely used by dental professionals). Topic 5 "care of dentures" presented information on how to remove and reinsert full and partial dentures, along with denture brushing techniques. Each topic had specified learning outcomes and consisted of a set of activities such as reading evidence-based information, watching an audiovisual resource and answering a reflective question worksheet. The estimated time to complete each topic was 30 min.

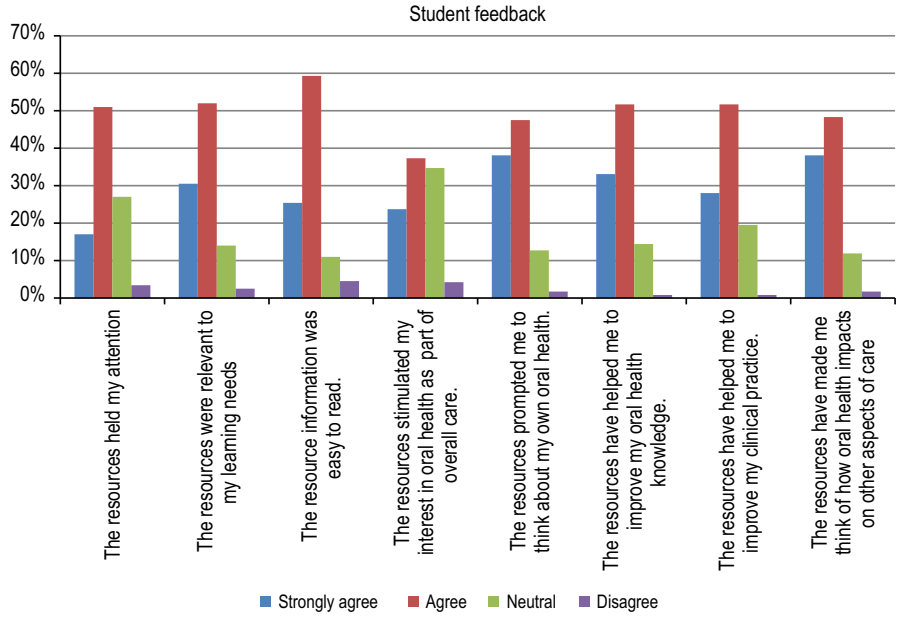
3.3 | Data collection

Students were invited to complete a questionnaire at the commencement of their respective course or unit and another when it had been completed. The preintervention questionnaire collected data on age, gender, course of study, country of birth, past experience as a personal carer and self-reported responses to a series of questions on oral health knowledge, skills and attitude using a Likert scale (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree). The postintervention questionnaire collected data on responses to the same series of questions on oral health knowledge, skills and attitude, along with some additional questions about the resources. Student responses to the resources were also captured in a number of open-ended questions. The student questionnaires were designed specifically for this study and were pilot-tested before implementation. Data on educator feedback were obtained through semistructured interviews.

3.4 | Data analysis

Quantitative data from the student questionnaires were analysed using descriptive and inferential statistics using SPSS statistics software (IBM SPSS Statistics, version 24, 2016). Categorical data were described using frequencies and percentages compared across courses. Pre- and postintervention questions were aggregated into categories of knowledge, skills and attitudes. Cronbach's alpha was used to measure the internal consistency within the knowledge, attitudes and skills composite variables. Linear mixed-effects models were undertaken to investigate the association between dependent variables: knowledge, skills and attitudes, and the interaction between course and period (pre/postintervention). Univariate linear mixed-effects regressions were performed separately for each dependent variable: knowledge, skills and attitudes by course, and then against the covariates (in separate models) of gender, age, country of birth and past experience as a personal carer. Covariates with *p* value < .2 were included in a multivariate model for each outcome. In the adjusted linear mixed-effects models, a *p* value of <.05 indicated statistical significance.

Data from postintervention-only questions on resource feedback were examined using ordinal logistic models to investigate the association between each individual question and course using Certificate III Aged Care as the reference value. Regressions tested whether the comparison value (e.g., BN) had odds of a low Likert scale value (1 = strongly agree and 2 = agree) greater than the reference value of Certificate III Aged Care. Univariate ordinal logistic



GRAPH 1 Student feedback on Building Better Oral Health Communities educational resources

regressions were performed separately for each question by course and the covariates (in separate models) of gender, age, country of birth and past experience as a personal carer. Covariates with p value < .2 were included in a multivariate model for each question, with course included as the predictor. In the adjusted ordinal logistic regression models, a p value of <.05 indicated statistical significance.

Qualitative data obtained from the student responses to postintervention open-ended questions and educator responses to the semistructured interviews were collated using evaluation categories of relevance to learning needs, presentation style and interest.

4 | RESULTS

4.1 | Students

Of 204 students who completed the preintervention questionnaire, the number of matched pre- and postintervention questionnaires was 124. Demographic data are described in Tables 2 and 3. Bachelor of Nursing students were found to be the youngest with Certificate III Aged Care students, the oldest of the student cohort. Students, across the courses, were predominantly female. The association between country of birth and course was found to be statistically significant, with higher percentages of BN students

TABLE 4 Comparing student feedback across courses using ordinal logistic regression models

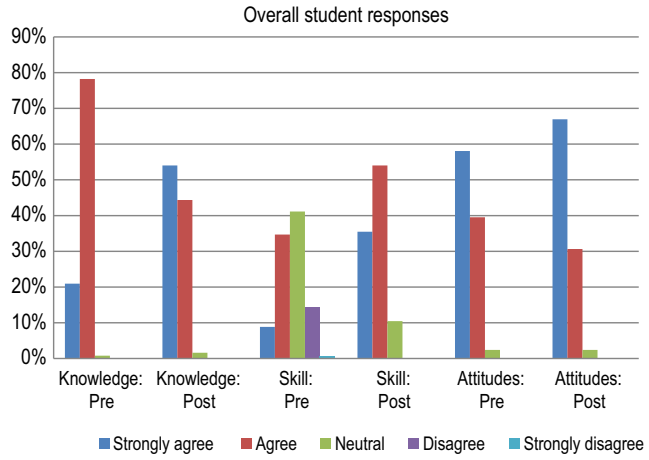
Outcome variable	Covariate variable	Adjusted odds ratio (95% CI)	Adjusted p value	Covariates controlled for in adjusted model
Q1 The resources held my attention	Course		.644	Gender Country
	BN	1.4 (0.66, 2.89)	.392	
	EN	1.4 (0.67, 2.76)	.389	
	Cert III[a]	1.0	–	
Q2 The resources were relevant to my learning needs	Course		**.039**	Country Experience
	BN	2.6 (1.19, 5.59)	.016	
	EN	2.4 (1.14, 5.03)	.021	
	Cert III[a]	1.0	–	
Q3 The resource information was easy to read	Course		.131	Gender Age Country
	BN	2.0 (0.87, 4.81)	.101	
	EN	2.1 (1.00, 4.57)	.048	
	Cert III[a]	1.0		
Q4 The resources stimulated my interest in oral health as part of overall care	Course		.079	Country
	BN	1.8 (0.86, 3.89)	.117	
	EN	2.3 (1.11, 4.65)	.024	
	Cert III[a]	1.0	–	
Q5 The resources prompted me to think about my own oral health	Course		.184	Country
	BN	1.4 (0.68, 3.08)	.338	
	EN	1.9 (0.94, 4.02)	.074	
	Cert III[a]	1.0	–	
Q6 The resources have helped me to improve my oral health knowledge	Course		**.029**	Age
	BN	1.8 (0.81, 4.18)	.147	
	EN	2.6 (1.27, 5.46)	.010	
	Cert III[a]	1.0	–	
Q7 The resources have helped me to improve my clinical practice.	Course		.145	Age
	BN	1.7 (0.75, 3.90)	.203	
	EN	2.1 (1.00, 4.26)	.051	
	Cert III[a]	1.0	–	
Q8 The resources have made me think of how oral health impacts on other aspects of care	Course		.325	Age
	BN	1.8 (0.78, 3.99)	.160	
	EN	1.63 (0.81, 3.30)	.172	
	Cert III[a]	1.0	–	

BN, Bachelor of Nursing; EN, Diploma of Nursing; Cert III, Certificate III Aged Care qualification.

[a]Certificate III Age Care as reference value. Bold text indicates statistical significance with a p value of <.05.

TABLE 5 Collated student feedback on resources using Kirkpatrick Model level 1 evaluation categories

Evaluation category	What students liked about the resources	What students thought could be improved
Relevance to learning	*Learning needs* Informative, helpful, appropriate Improved oral health knowledge and dispelled myths	*Learning needs* More classroom teaching on oral health
Presentation style	*Accessibility* Easy to access and find information	*Accessibility* Website sometimes difficult to access and navigate
	Structure/format Resources easy to understand Aesthetically pleasing Well set out in a logical manner Precise and well written	*Structure/format* Fast-track summaries
	Visual resources Photographs, videos and quizzes very useful for oral health assessment and care techniques	*Visual resources* More photographs, videos, interactive online quizzes Cradle-hold technique when brushing teeth was confronting
Interest	*Reaction* Interactive and engaging Ignited interest in oral health as part of overall care Provided insight into self-care	*Reaction* No improvement suggested



GRAPH 2 Student responses to pre- and postintervention knowledge, skills and attitude questions

born in Australia than students undertaking Certificate III Aged Care, and lesser numbers of Australian-born students undertaking the EN. A small number of students, across the courses, reported previous experience as a personal carer.

4.1.1 | Kirkpatrick level 1 evaluation results

Kirkpatrick level 1 evaluation used the categories of relevance to learning needs, presentation style and interest in oral health to gauge student satisfaction with the resources. Graph 1 depicts the aggregated positive student feedback to postintervention resource questions, showing minimal "disagree" responses and no "strongly disagree" replies. Further analysis (reported in Table 4) used adjusted ordinal logistic regression models to show statistically significant associations with student learning needs and improvements in oral health knowledge. For example, associations were demonstrated with Question 2 "The resources were relevant to my learning needs" and course, and with Question 6 "The resources have helped me to improve my oral health knowledge" and course. As described in Table 5, the collated student responses on what they liked about the resources and what could be improved were mainly positive. Reports of website outage and concerns about the teaching of the cradle-hold technique were identified as areas for improvement.

4.1.2 | Kirkpatrick level 2 evaluation results

Kirkpatrick level 2 evaluation involved quantifying whether student learning had taken place in terms of self-reported changes in oral health knowledge, skills and attitudes. Analysis indicated that there was acceptable to good internal consistency within the knowledge, attitudes and skills composite variables A comparison between aggregated pre- and postintervention student responses is presented in Graph 2. No negative student responses in terms of "disagree" or "strongly disagree" were given at postintervention.

Results comparing the knowledge, skills and attitude scores across courses and time, using linear mixed-effects modelling, are provided in Table 6. Modelling at preintervention showed that BN students had a statistically significant higher mean oral health knowledge score than EN students and Certificate III Aged Care students. Similarly, EN students had a statistically significant higher mean oral health knowledge score than Certificate III Aged Care students. Postintervention modelling indicated that the mean oral health knowledge scores among the courses were not significantly different, suggesting reduced differences across the courses. Each student

group, at postintervention, also demonstrated statistically significant higher scores in their oral health knowledge.

Similarly, student oral health skills at preintervention showed that BN students had a statistically significant higher starting mean oral health skills score than EN students and Certificate III Aged Care students. EN students and Certificate III Aged Care students demonstrated similar mean oral health skills scores. Postintervention modelling showed reduced differences in the mean oral health skills scores among the courses, suggesting that students achieved similar levels of oral health skills across the courses. Each student group, at postintervention, also demonstrated statistically significant higher scores in their oral health skills.

TABLE 6 Comparing knowledge, skills and attitude scores across courses and time using linear mixed-effects modelling

Outcome variable	Course/Time	Adjusted estimate (95% CI)	Adjusted *p* value	Covariates controlled for in adjusted model
Knowledge			**.053**	Country Gender Experience
	Pre			
	BN vs. EN	−2.7 (−4.7, −0.6)	.011	
	BN vs. Cert III	−5.6 (−8.4, −2.7)	<.001	
	EN vs. Cert III	−2.9 (−5.6, −0.2)	.035	
	Post			
	BN vs. EN	1.1 (−2.0, 4.1)	.485	
	BN vs. Cert III	−0.2 (−4.6, 4.1)	.909	
	EN vs. Cert III	−1.3 (−5.4, 2.8)	.523	
	Post vs. Pre			
	BN	−3.4 (−6.2, −0.6)	.019	
	EN	−7.1 (−9.3, −4.9)	<.001	
	Cert III	−8.7 (−13.0, −4.4)	<.001	
Skills			**<.001**	Country Experience
	Pre			
	BN vs. EN	−0.8 (−1.4, −0.3)	.005	
	BN vs. Cert III	−1.5 (−2.3, −0.6)	.001	
	EN vs. Cert III	−0.6 (−1.4, 0.1)	.113	
	Post			
	BN vs. EN	0.4 (−0.1, 0.8)	.132	
	BN vs. Cert III	0.5 (−0.1, 1.2)	.115	
	EN vs. Cert III	0.2 (−0.8, 0.5)	.594	
	Post vs. Pre			
	BN	−0.9 (−1.5, −0.3)	.002	
	EN	−2.1 (−2.6, −1.7)	<.001	
	Cert III	−2.9 (−3.8, −2.0)	<.001	
Attitude			.813	Gender Experience
	Pre			
	BN vs. EN	0.5 (−1.0, 2.0)	.490	
	BN vs. Cert III	−0.8 (−2.9, 1.4)	.470	
	EN vs. Cert III	−1.3 (−3.4, 0.7)	.206	
	Post			
	BN vs. EN	0.7 (−0.8, 2.3)	.356	
	BN vs. Cert III	0.2 (−2.0, 2.4)	.854	
	EN vs. Cert III	−0.5 (−2.6, 1.6)	.628	
	Post vs. Pre			
	BN	−0.7 (−2.4, 1.0)	.406	
	EN	−09 (−2.2, 0.4)	.176	
	Cert III	−1.7 (−4.3, 0.9)	.197	

BN, Bachelor of Nursing; EN, Diploma of Nursing; Cert III, Certificate III Aged Care qualification. Bold text indicates statistical significance with a *p* value of <.05.

Modelling showed that attitudes towards oral health did not change. At preintervention and postintervention, there were no statistically significant differences in the mean oral health attitude scores among the courses. Likewise, there were minor differences in the mean oral health attitude scores between pre- and postintervention for any student group. When these results were compared with the median and interquartile range (25%–75%) of responses to the pre- and postintervention questions (described in Table 7), it was found that, unlike the self-reported differences for oral health knowledge and skills, student's attitudes towards oral health were consistently positive (1 = strongly agree and 2 = agree).

4.2 | Educators

Six educators (two educators from each of the courses of study) were interviewed. All six interviewees had a background as a registered nurse. In terms of Kirkpatrick level 1 evaluation, the aggregated educator responses (presented in Table 8) showed affirmative responses to relevance to learning, presentation style and interest, inferring that educators endorsed the resources as a useful learning and teaching package. As with the student feedback, website outage and concerns about the application of the cradle-hold technique were identified as areas for consideration.

5 | DISCUSSION

Oral health has been acknowledged as one of the most neglected aspects of nursing care experienced by older people. Insufficient nurse and care worker oral health knowledge and skills have been cited as contributing to this. Given the difficulties in sustaining workplace oral health training programmes, it is recommended that the oral health content of entry-level nursing and aged care qualifications be strengthened. The aim of this study was to evaluate whether a set of resources called Building Better Oral Health Communities was a relevant learning and teaching package for promoting oral health as one of the fundamentals of care

TABLE 7 Median and interquartile range (25%–75%) of student responses to pre- and postintervention knowledge, skills and attitude questions

Outcome variable		Preintervention Median (IQR)	Postintervention Median (IQR)
Knowledge	Q1. I know what good oral health is	2.0 (1.0, 2.0)	2.0 (1.0, 2.0)
	Q4. A hard bristled brush is not best for cleaning teeth (reversed)	4.0 (3.0, 5.0)	2.0 (1.0, 3.0)
	Q5. A dirty mouth may cause pneumonia in older people	3.0 (2.0, 3.0)	2.0 (1.0, 2.0)
	Q6. Drinking plain tap water after eating protects teeth	2.0 (2.0, 3.0)	2.0 (2.0, 3.0)
	Q7. Dentures should be taken out overnight (reversed)	2.0 (1.0, 3.0)	2.0 (1.0, 2.0)
	Q8. Teeth should be brushed a minimum of twice a day	1.0 (1.0, 2.0)	1.0 (1.0, 2.0)
	Q9. Bleeding gums means you should continue to brush teeth (reversed)	2.0 (1.0, 2.0)	1.0 (1.0, 2.0)
	Q10. Dry mouth is a cause of oral health problems	2.0 (2.0, 3.0)	2.0 (1.0, 3.0)
	Q11. Fluoride protects teeth	2.0 (1.0, 2.0)	1.0 (1.0, 2.0)
	Q12. People with diabetes have greater risk of gum disease	2.0 (1.0, 3.0)	2.0 (1.0, 2.0)
	Q14. You should always not rinse after brushing teeth (reversed)	3.0 (2.0, 4.0)	2.0 (1.0, 3.0)
	Q16. You should brush where the teeth meet the gum	2.0 (1.0, 2.0)	2.0 (1.0, 2.0)
	Q18. Normal toothpaste should not be used to clean dentures (reversed)	3.0 (2.0, 3.0)	2.0 (1.2, 3.0)
	Q20. Toothbrushes should be replaced every 3 months	2.0 (1.0, 2.0)	1.0 (1.0, 2.0)
	Q22. Medications are a common cause of dry mouth	2.0 (2.0, 3.0)	2.0 (1.0, 2.0)
	Q24. Smoking increases the risk of oral cancer	1.5 (1.0, 2.0)	1.0 (1.0, 2.0)
	Q25. Frequent snacking does cause tooth decay (reversed)	2.0 (2.0, 3.0)	2.0 (1.0, 3.0)
Skills	Q3. I know how to do an oral health assessment	3.0 (3.0, 4.0)	2.0 (2.0, 3.0)
	Q17. I have the skills to be able to provide effective oral care	2.5 (2.0, 3.0)	2.0 (1.0, 2.0)
Attitudes	Q2. I believe mouth care is a normal part of personal care	1.0 (1.0, 1.0)	1.0 (1.0, 1.0)
	Q13. Older people usually do have natural teeth (reversed)	2.0 (2.0, 2.0)	2.0 (2.0, 2.0)
	Q15. I like cleaning other people's mouths (reversed)	3.0 (2.0, 3.0)	2.0 (2.0, 3.0)
	Q19. I think oral health care is my job, not a dentists (reversed)	1.0 (1.0, 2.0)	1.0 (1.0, 2.0)
	Q21. People with dentures do have oral health problems (reversed)	2.0 (1.0, 2.0)	1.0 (1.0, 2.0)
	Q23. I don't avoid doing mouth care on people with dementia (reversed)	2.0 (1.0, 3.0)	2.0 (1.0, 2.7)
	Q26. Good oral health is important for healthy ageing	1.0 (1.0, 2.0)	1.0 (1.0, 1.0)

TABLE 8 Collated educator feedback using Kirkpatrick Model level 1 evaluation categories

Evaluation category	Collated educator feedback
Relevance	Content
	Reinforced that oral health was an important aspect of fundamental nursing care
	Highlighted the consequences of poor oral health
	Prompted a more comprehensive approach to oral health care by broadening the focus of learning about tooth brushing and denture cleaning to include oral health assessment, oral healthcare planning and dental referral
	Increased awareness of oral care products, consequences of dry mouth and the use of techniques to manage care resistive behaviours
	Introduced new skills techniques routinely used by dental professional such as cradle-hold to support a person's head and jaw while brushing teeth. While some educators encouraged students to practise this, others found the approach confronting and a source of much discussion
	Considered an aged care focus appropriate because when students learn about fundamentals of nursing care, they were more than likely doing an aged care clinical placement
	Acknowledged that oral healthcare principles could be integrated across the course curriculum and easily adapted to suit the acute care context. For example, oral care for patients who have nasogastric or tracheostomy tubes or patients undergoing chemotherapy
Presentation style	Instructional design
	Provided educators with a variety of teaching options either using videos to promote classroom group work and discussions with students working through activities and worksheets or as an additional student self-learning resource or for remedial work if students have missed a particular teaching session
	Assessed the information to be pitched at an appropriate level
	Found that information could be directly applied to clinical skills teaching
	Noticed students showing more initiative and increased interest in participation in oral care during clinical skills sessions
	Technical design
	Liked that it was a cost-free online resource
	Considered it to be a logical, well laid-out format
	Liked that it was highly visual and easy to use
	Reported that the website was sometimes difficult to access
Interest	Future use
	Felt inspired to devote more teaching time to oral health care and incorporate the resources as a permanent part of teaching programme
	Would recommend the resources to other educators

for students studying an entry-level nursing or aged care qualification.

Kirkpatrick's Model of learning and training was implemented as an evaluation tool. For the purposes of this study, only levels 1 and 2 of the model were considered as part of the evaluation process. As prescribed study materials, the resources were used by students to prepare for clinical skills sessions relating to personal care, and for their clinical placement in aged care. In terms of relevance to learning needs, presentation style and interest in oral health, Kirkpatrick level 1 evaluation findings showed positive student satisfaction with the resources. Students considered them informative, helpful and relevant to their learning needs. The resources were generally described as easy to access despite issues of website outage. The presentation style (especially the visual design) was popular with some students, suggesting that more visuals combined with fast-track written summaries were important. Students also considered the resources engaging and easy to understand, prompting an interest in oral health as part of overall care as well as providing insight into self-care.

Educator feedback supported these findings describing the resources as an effective learning and teaching package that enhanced the teaching of oral health as one of the fundamentals of care, strengthened clinical skills sessions and encouraged the integration of a more comprehensive approach to oral health across the course curriculum. This included educators applying the information to suit other contexts such as acute care. The presentation style provided educators with a range of learning and teaching options (both classroom and student self-directed) that could be applied to the different course types to support clinical skills teaching. Educators reported that they felt inspired to devote more time to the teaching of oral health care, committing to incorporate the resources as a permanent part of their teaching programme.

In the Kirkpatrick level 2 evaluation, positive learning outcomes were demonstrated. While the study reported knowledge, skills and attitudes as separate categories, they are acknowledged as interrelated domains of care. Self-reported learning outcomes of BN students, EN students and Certificate III Aged Care students showed

consistently positive attitudes towards oral health, and significant improvements in their oral health knowledge and skills. Not surprisingly, comparisons made among the courses indicated that oral health knowledge and skill levels at preintervention differed across the course types with BN students demonstrating higher levels of knowledge and skills than EN and Certificate III Aged Care students. However, at postintervention, these differences were shown to be smaller, suggesting that, irrespective of the course type and adjusting for other factors (such as age, gender, country of birth and past experience as a personal carer), students reported similar oral health knowledge and skills. From the perspective of fundamental care, this finding is important because it endorses the expectation that, regardless of the differences in scope of practice, nurses and care workers must be able to provide consistent standards of daily oral health care.

While the study demonstrated positive Kirkpatrick level 1 and 2 evaluation findings, some potential barriers were foreseen in terms of (i) level 3 evaluation concerning a student's ability to transfer learning into practice and (ii) level 4 evaluation measuring improved care. For example, apprehension about the application of the cradle-hold position prompted reflection on nurse educator oral health skills. This finding may be indicative of a lack of confidence with what was for all intents and purposes a nontraditional nursing technique, signifying that educators and students might benefit from engaging with the dental sector in interdisciplinary learning and teaching. Likewise, given that students exhibited consistently positive attitudes, factors independent of training (such as the workplace culture, care routines and perceptions of oral health care as a low priority) might have a negative influence on students, resulting in a lowering of the standard of care provided.

Further evaluation therefore calls for longer-term collaborative research (involving dental professionals, nurse educators, care managers, practitioners and policy makers) to facilitate sustainable improvements in older people's oral health care. Consequently, the strengthening oral health learning and teaching of nurses and care workers must go, hand in hand, with advocating for greater aged care reforms that shift oral health from its current low priority to that of mandatory fundamental care. Concurrent research might also include raising the oral health awareness of older people and their families so that, as consumers, they can expect to receive appropriate standards of oral health care. This multidimensional approach is pertinent, given the ageing population and the recognised benefits that good oral health has for older people's quality of life and well-being.

6 | CONCLUSION

The use of Kirkpatrick's Model to evaluate the relevance of the Building Better Oral Health Communities resources for different student groups (BN, EN and Certificate III Aged Care) showed positive levels of student and educator satisfaction. Students demonstrated consistently positive attitudes and significant self-reported improvements in their oral health knowledge and skills. It is therefore recommended that this validated learning and teaching package be used by educators to promote oral health as one of the fundamentals of care for entry-level nurse and aged care qualifications.

6.1 | Study Limitations

The study did not use a randomised control group design, and the relatively small sample size makes statistical interpretation difficult. Data relied on student self-reporting rather than direct clinical assessment of oral health competency. The questionnaires were developed specifically for this study and require further testing.

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CONTRIBUTIONS

Study design: AL; data collection and analysis; AL, SE and manuscript preparation: AL, SE, FD, GW.

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