Australian Journal of Teacher Education

Volume 45 | Issue 5 Article 4

2020

Pre-Service Teachers' Mobilising Health Literacy in Sun Safety Education

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Abstract: School-based educational programs are identified as an effective means to increase awareness and promote sun protective behaviours in young people. Regardless, the adolescent age group are difficult to influence, somewhat resistant to sun protection and esteem tanned skin. The ability of Pre-Service Teachers (PSTs) to develop sun safety education for adolescents was tested at a teacher education institution in Western Australia. More particularly, to create understandings of their ability to mobilise health literacy in sun safety education. Thirty PSTs studying secondary education developed three consecutive lesson plans for use with adolescent students of Year 7. The three lesson plans comprised learning activities (n=444), which were categorised as teaching either functional, interactive or critical health literacy. Results indicate a significantly greater than expected frequency of functional activities, suggesting that PSTs need specific training to support the planning and development of teaching and learning that promotes critical health literacy skills.

Introduction

Australia has the highest rates of invasive melanoma in the world due to high levels of Ultra Violet Radiation (UVR) and significant opportunity for high exposure to UVR (Carter & Donovan, 2007; Fransen et al., 2012; Williams, Jones, Caputi, & Iverson, 2011). Invasive melanoma is the most lethal of all skin cancer types (Gordon & Rowell, 2015; Kristjánsson, R, Månsson-Brahme, Widlund-Ivarson, & Ullén, 2003), accounting for 1960 Australian deaths in 2016 (Cancer Council of Australia [CCA], 2019) and 1304 West Australian deaths in 2014 (Cancer Council of Western Australia [CCWA], 2019). Non-melanoma is less dangerous than invasive melanoma but from an economic perspective it is more costly in Australia, attributing to over one million skin cancer treatments annually at a cost in excess of $650 million (Barwood & Jones, 2019). Non-melanoma includes basal cell carcinoma and squamous cell carcinoma (Slevin, 2014). The CCA report that one in three Australians will be diagnosed with some form of skin cancer "by the time they are 70" (par. 1, 2019) and more pertinently, that 95% of melanoma diagnosis in Australia is caused by over exposure to UVR (CCA, 2019). Western Australia (WA) rates second only to Queensland as the Australian State with the highest incidences of invasive melanoma (Olsen, Green, Pandeya, & Whiteman, 2019). Western Australia is the context for this research.

Sun Safety Education in Australia

Melanoma and non-melanoma are preventable with simple measures like covering up and avoiding the sun's harmful UVR reducing risk and susceptibility. This is especially pertinent at peak times of the day (Gordon & Rowell, 2015) where UVR levels in Australia can rise well above the recommended level of 3 on the Ultra Violet Index (UV Index). The UV Index is a public messaging system that reports UVR on a scale, ranging from 0 – 11^{+} with 3 – 5 indicating moderate risk to UVR exposure and subsequent harm. Although factors like family genetics and skin type such as fair skin are contributors to melanoma risk, these are less significant than overexposure to the sun. Globally, overexposure to UVR accounts for approximately 80 – 90% of melanoma incidences (Eastabrook, Chang, & Taylor, 2018; L. Harrison & Colquhoun, 2007; Harrison, Saunders, & Nowak, 2007; Rainous, Hermann, & Abraham, 2018), which is a considerably lower incidence percentage than that recorded in Australia.

In view of the high risk of overexposure to UVR, Australian researchers caution against complacency with sun safety at any age (O'Leary, 2019). However, more globally but not excluding Australia, childhood and adolescence is regarded as a significant period for skin cancer prevention, with cancer-causing exposure at this critical time increasing the risk of developing skin cancer in later life (Dobbinson et al., 2009; Harrison et al., 2007; Kristjánsson et al., 2003; Williams et al., 2011; World Health Organization, 2002). School-based sun safety education programmes, public announcements of UVR recordings such as on radio and television, and government initiatives to increase sunshades in schools are having some impact but research shows that melanoma incidence in young people is on the rise (CCWA, 2018; CCA, 2019). This is particularly prevalent in young West Australians (CCWA, 2018) with research suggesting that this age group desists from sun protective actions and at times, purposefully sun tanning their bodies (Barwood, Brady, & Jones, 2017; Williams et al., 2011). International research presents similar concerns (Kristjánsson et al., 2003), purporting a disjunction between adolescents' high level of knowledge, poor adherence to sun safe behaviour and appreciation for tanned skin (Eastabrook et al., 2018; Rainous et al., 2018).

Australia has a strong history in campaigning sun safety and providing sun safe education to its citizens. Like many other countries with excessive UVR such as New Zealand and South Africa, schools are highly regarded as an important conduit to raise awareness of the danger of sun and UVR exposure (Harrison, Garzon-Chavez, & Nikles, 2016; Wright, Reeder, & Albers, 2016). School-based sun safe education initiatives like 'No hat no play' and the broader community-based initiative, 'Slip, Slop, Slap, Seek and Slide' are standard practice in most Australian primary schools (Cancer Council of Victoria [CCV], 2020) but traction of such initiatives are not as successful in the secondary school setting (CCV, 2018; 2020). Installation of UV meters on school grounds, promotion of shade-seeking behaviour and specific programs like SunSmart (CCV, 2018; CCWA, 2013) have improved sun behaviour in younger children but there is general consensus that greater effort is needed to encourage attitudinal change with the adolescent age group (Barwood et al., 2017; Barwood & Jones, 2019). This research explores the preparedness of PSTs to deliver sun safety education in the secondary school setting and specifically, their ability to mobilise health literacy in sun safety education as a means to support safer behaviours of young people when in the sun.

Health Literacy

Health literacy is formally recognised in the Australian Curriculum for Health and Physical Education (AC: HPE) as an empowerment strategy to equip young people to take action for own and others' health (Australian Curriculum, Assessment and Reporting Authority [ACARA], 2012; ACARA, 2015). It is explicitly identified as one of five inter-related propositions underpinning pedagogy in the delivery of HPE in Australian schools (ACARA, 2015; Wright, 2014; School Curriculum and Standards Authority [SCSA], 2015). When combined with the four other propositions:

- focus on educative purpose;
- a strengths-based approach;
- valuing of movement; and
- a critical inquiry approach,

Health literacy guides Australian teachers to mobilise a futures focused approach to teaching and learning that emphasises what young people are and can do to support their health and wellbeing. More particularly, the five propositions work together to provide a blueprint for teaching and learning that focuses on strengthening and supporting young peoples' healthier, safer and more physically active living. This contemporary and evidence-informed pedagogical approach is a far cry to the outdated and ineffective 'pathogenic' or 'at risk' approach that featured in HPE curriculum policy documents in decades past which sought to 'fix' the health of young people through scare tactics and at times, activities that blamed and shamed. For example, and as a philosophical positioning to HPE pedagogy rooted in neoliberal health reform, the pathogenic approach assumed that all young people had poor health behaviours resulting from poor health decision-making (Barwood & McMaster, 2019). Furthermore, in the classroom and in the teaching and learning of HPE more generally, the pathogenic approach focused on what young people were doing wrong as opposed to what they could do and/or were doing to support their health. For example, in the context of sun safety education a teaching focus could have been to explore the impact of sunburn and sun exposure on the skin as opposed to supporting young people to pre-plan for safer sun-based activity.

The development of the AC: HPE (ACARA, 2015) and through teachers working with the five propositions to inform contemporary pedagogy, a new approach to HPE has actively sought to engage children and young people in 'ways' of learning that explore, acknowledge, strengthen and support health enhancing dispositions. Monikered as a 'strengths-based' approach to HPE pedagogy, teaching and learning now recognises the health assets of individuals and community groups whilst building upon these assets and creating awareness and responses to contextual health needs and priorities (Barwood et al., 2017). The inclusion of health literacy as a key proposition in the blueprint of HPE curriculum in Australia reflected an emerging focus on what are the 'influencers' on health outcomes (World Health Organization [WHO], 2013) and the capacity of HPE to support and shape personal and community health, safety and wellbeing (Alfrey & Brown, 2013). Inclusion also recognised the significance of critical analysis, decision making, advocacy and empowerment to promote health, safety and physical activity participation (Nutbeam, 2000). Moreover, the application of problem-solving techniques, including the critique and challenge of assumptions and the navigation through a range of health-related sources, services and organisations sought to better equip children and young people with knowledge and skills to be agentic with their health. When used in the context of sun safety education, this approach and in particular; health literacy, aims to support young people to enact, promote and advocate safer sun practices for themselves and others.

The Australian HPE curriculum conceptualisation of health literacy follows Nutbeam's (2000, 2008) and the WHO's (2013) focus on the agentic ability of an individual to attain, maintain and advocate good health. More specifically, the development of personal, cognitive and social skills to make informed decisions to exert greater control over life and health (Shohet & Renaud, 2006). Nutbeam (2000) utilises a three-level hierarchy to organise health literacy skill (see Table 1 below).

Level of health literacy	**Ability**
Functional health literacy	Understand health information through cognitive and literacy skills
Communicative or interactive health literacy	Understand and apply health information in personal and social contexts through more advanced cognitive and literacy skills
Critical health literacy	Critically analyse health-related information and develop personal and community action through advanced cognitive and literacy skills

Table 1: Nutbeam's health literacy hierarchy (2000, 2008)

The ability of teachers to action critical health literacy in teaching and learning, and facilitate student participation in rich, inquiry-based, self-reflective and agentic behaviour is central to this paper (McCuaig, Carroll, & Macdonald, 2014; Renwick, 2014). Specifically, via the development of authentic learning activities that allow students to explore, process, contemplate and reflect on understandings of health knowledge(s) as dynamic and contestable and health skills as empowering (McCuaig et al., 2014; Renwick, 2013). The context for the paper is the preparation of PSTs of health education at an Initial Teacher Education institution (ITEI) in WA, and the ability of the PSTs' to mobilise and work with health literacy as an educational tool in sun safety education and lesson planning. Consideration of the Australian Professional Standards for teachers (Australian Institute for Teaching and School Leadership [AITSL], 2011b) is pertinent to the study, as seven standards scope performance across three domains of teaching: Professional Knowledge, Professional Practice and Professional Engagement. These domains are further scoped across four career stages: graduate teacher, proficient teacher, highly accomplished teacher and lead teacher (see Table 2). To receive accreditation for undergraduate and post-graduate programs, ITEIs in Australia provide evidence of PST achievements at the graduate teacher level (AITSL, 2011a). In the context of this paper, the PSTs mobilised Graduate Standard 2 and Graduate Standard 3 (AITSL, 2011b) (see Table 2) in the preparation of lesson plans of sun safety education.

Domains of Teaching	**Standards**
Professional Knowledge	1. Know the students and how they learn 2. Know the content and how to teach it
Professional Practice	3. Plan for and implement effective teaching and learning 4. Create and maintain supportive and safe learning environments 5. Assess, provide feedback and report on student learning
Professional Engagement	6. Engage in professional learning 7. Engage professionally with colleagues, parents/carers and the community

Table 2: Australian Professional Standards for Teachers (reproduced from AITSL, 2011b, p. 3)

Method

In cooperation with the CCWA, the ITEI initiated a sun safety intervention for PSTs to increase their sun safety knowledge, awareness of UVR, the UV Index and sun safe behaviours. The PSTs were enrolled in an ITE course to prepare them to teach secondary education for students of the age range, 12 to 18 years, and the schooling years from Year 7 to Year 12 in Australia. The sun safety intervention was distributed to the PSTs via a curriculum-based unit in this course. The unit specifically focused on curriculum, pedagogies and content in the school-based subject of health education. Graduate Standard 2 and Graduate Standard 3 were specifically featured in the learning outcomes for the unit (AITSL, 2011b).

Prior to the intervention, the PSTs were invited to participate in a three-phase sun safety education study. Ethical approval was obtained from the ITEI's Human Ethics Research Committee prior to commencing the three phases of the study. The first phase of the study examined the PSTs' sun safe knowledge and sun behaviours via a pre- and post-intervention online survey. More specifically, prior to and following a three hour education-based sun safety intervention, which comprised a PowerPoint presentation and PST participation in specific learning activities designed for use in schools, 48 PSTs completed online surveys. These identical pre- and post-intervention surveys were adapted from the CCWA's annual SunSmart campaign evaluation survey. Of the 48 PSTs, only 30 correctly completed both surveys to allow comparison of data. Results are briefly discussed in a later part of this paper; however, analysis of the survey data was performed using SPSS 23 with findings published in a previous paper (Barwood et al., 2017).

The second phase of the study sought to support teachers and beginning teachers contending with curriculum changes impacting WA schools through the identification of potential content inclusions for sun safety education. More specifically, the second phase examined the PSTs' ability to transfer sun safe knowledge into three consecutive sun safety lesson plans for use with Year 7 students. This age group was selected for the study as Year 7 is the first year of secondary education in Australia and research indicates that this age group is particularly susceptible to poor sun behaviour (Dobbinson et al., 2009; Kristjánsson et al., 2003; Williams et al., 2011). Furthermore, secondary education settings are not as compliant to sun safety interventions as primary schools.

Of the 48 PSTs who developed three lesson plans (lesson bundle) to respond to pre-selected curriculum descriptor identified from the syllabus for Year 7 Health Education (SCSA, 2015) and displayed in Table 3 below, 30 lesson bundles were selected for inclusion in the study. Inclusion criteria was determined by three experienced researchers who critically examined and ranked the lesson bundles according to criteria that focused on pedagogy and educational effectiveness. The top 30 lesson bundles were then iteratively re-analysed utilising constant comparison and analytic induction technique to identify central themes and/or content inclusions. In total, the 30 PST lesson plans (n = 90) were analysed a total of three times (n = 270) to ensure that the content identified emerged from the 90 lessons as a whole. Results from phase two are published in another paper (Barwood & Jones, 2019).

Year	Descriptor
Year 2	Actions that keep people safe and healthy in and outside the classrooms such as being sun smart
Year 5	Strategies that promote a safe, healthy lifestyle, such as practicing sun safety
Year 7	Preventive health practices for young people to avoid and manage risks such as sun protective behaviours

Table 3: Sun Safety Content Descriptors (SCSA, 2015)

This paper refers to the third phase of the study and aims to create understandings of the PSTs' ability to mobilise health literacy in lesson planning. Using the same 30 lesson bundles selected for inclusion in phase two of the study, the 90 lesson plans (30 x 3 lesson plans) were exhaustively examined to categorise the included learning activities (n=444) according to health literacy criteria. That is, the 444 learning activities were categorised as either functional, interactive or critical health literacy (Nutbeam, 2000, 2008). As per phase two, the 444 lesson activities were analysed three times (n=1332) via constant comparison and using the lens of Nutbeam's criteria for health literacy, deductively categorised into three types of learning activities.

Results and Discussion

An initial frequency examination of the data shows an even spread of learning activities across the PSTs' three lesson plans (see Table 4).

Lesson Plan	Number	Percentage %
Lesson 1	155	34.90%
Lesson 2	150	33.78%
Lesson 3	139	31.30%
Total	444	

Table 4: Health literacy frequency distribution in lesson planning

With alpha set at .05, a one-way chi-square analysis was performed to examine the frequency of each categorisation of learning activity. The expected frequency for all cases were either equal to or greater than five. There was a statistically significant difference in the frequency of each categorisation of learning activity x^2 (2, N = 444) = 233.68, p = .000. Table 5 presents the observed and expected frequencies, as well as the standardised residuals for each categorisation of learning activity.

Category of health literacy	Observed number	Expected number	Standardized Residual
Functional	279	148	131.0
Interactive	149	148	1.0
Critical	16	148	-132.0
Total	444		

Table 5: Health literacy categorisation in lesson planning

We would expect to see an even spread in the number of each categorisation of learning activity. Instead, there was a larger than expected number of learning activities categorised as functional (n = 279, 62.83%) and a smaller than expected number of learning activities categorised as critical (n = 16, 3.60%). The number of learning activities categorised as interactive was close to that which was expected (n = 149, 33.55%). One explanation for the greater than expected number of learning activities categorised as functional could be attributed to the PSTs inexperience in lesson planning and focusing on reactive health behaviour and actions as opposed to proactive or agentic health behaviour and action. For example, pathogenic practices to support the correct application of sunscreen as opposed to sun and skin surveillance and/or pre-planning to reduce possible exposure to UVR. This explanation could also account for the lower than expected number of learning activities categorised as critical, where the PSTs reverted to what they were familiar with in regard to sun safety as opposed to creating learning activities that focused on developing

young people who could take action to effectively plan for sun safety in the outdoors across the life span.

A two-way chi square analysis was then conducted to determine if there was a difference in the frequency of each type of activity according to the lesson (first, second, or third lesson). The proportions of functional, interactive, and critical activities were significantly different for the three different lessons x^2 (4, N = 444) = 31.56, p = .000, Cramer's V = .189. Specifically, the observed number of functional learning activities in the first lesson was significantly greater than expected, the observed number of interactive activities in the second lesson was significantly greater than expected, and the observed number of critical activities in the third lesson was significantly greater than expected. The frequencies (observed and expected), as well as the percentages and adjusted standardized residuals are presented in Table 6.

	Functional				Interactive				Critical				
Lesson	***f***	**%**	***fe***	**ASR**	***f***	**%**	***fe***	**ASR**	***f***	**%**	***fe***	**ASR**	**Total**
1	119	76.8%	97.4	4.5*	34	21.9%	52.0	-3.8	2	1.3%	5.6	-1.9	155
2	86	57.3%	94.3	-1.7	62	41.3%	50.3	2.5*	2	1.3%	5.4	-1.8	150
3	74	53.2%	87.3	-2.8	53	38.1%	46.6	1.4	12	8.6%	5.0	3.8*	139

f, frequency; *fe*, expected frequency; ASR, Adjusted Standardised Residuals
*p < .05

Table 6: Frequencies, Percentages, and Adjusted Standardised Residuals for Functional, Interactive, and Critical activities across Three Different Lessons

Analysis of the PST lesson plans revealed that functional activities (76.8%) were more likely to be observed in the first lesson compared to the second or third lesson plans (Figure 1). Interactive activities (41.3%) were more likely to be observed in the second lesson rather than the first or the third lesson plans. Critical activities (8.6%) were more likely to be observed in the third lesson than the first or second lesson plans.

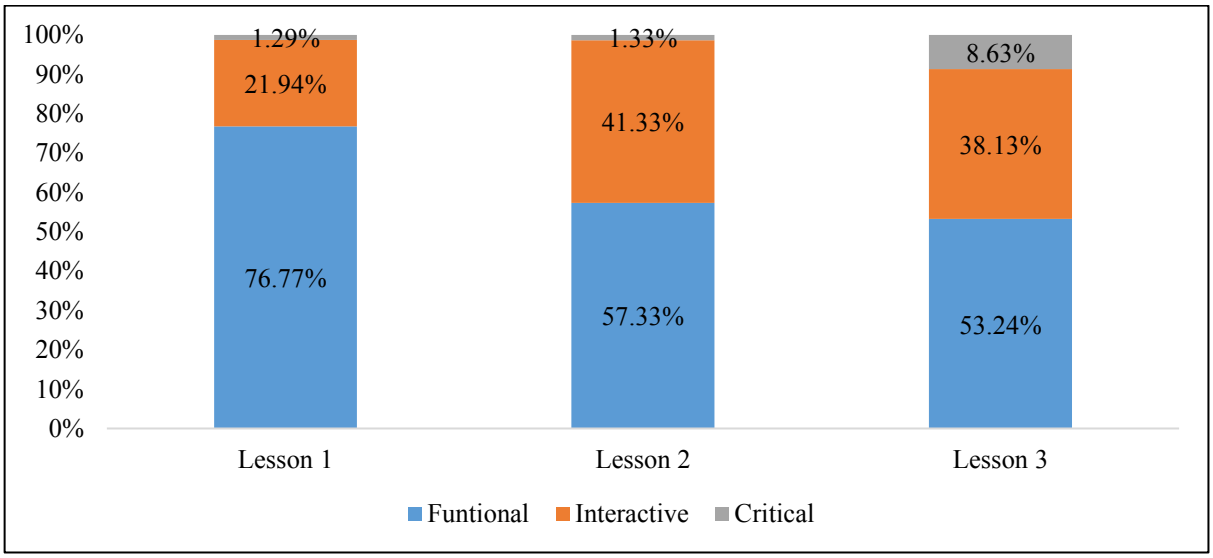

Figure 1: Frequency of activity type planned across three consecutive lessons

Functional Health Literacy Activities

The observed number of activities categorised as functional in the first lesson was significantly larger than expected (see Table 6). In comparison, the number of activities

categorised as functional in the second or third lesson was less than expected. From a theoretical and pedagogical perspective (Renwick, 2013; 2014), the larger than expected number of functional activities in the first lesson makes sense as there is significant difference between the complexities of functional and critical health literacy skill (see Table I). Thus, the spread is consistent with the hierarchical development of health literacy skill as per Nutbeam (2000; 2008). However, the greater than expected number of learning activities categorised as functional could also be accounted for by the inexperience of the PSTs in lesson planning.

Interactive Health Literacy Activities

The observed number of activities categorised as interactive in the second and third lessons was larger than expected. However, it was in the second lesson that the difference between the observed and expected frequency of interactive activities was statistically significant (see Table 6). In comparison, the number of activities categorised as interactive in the first lesson was less than expected. The larger than expected number of interactive activities in the second lesson could be attributed to the PSTs attempting to scaffold learning and increase the complexity of learning activities according to Nutbeam (2000; 2008) and across the three lessons.

Critical Health Literacy Activities

The observed number of activities categorised as critical in the third lesson was significantly larger than expected (see Table 6). In comparison, the number of activities categorised as critical in the first and second lesson was less than expected. The larger than expected number of critical activities in the third lesson could also be attributed to the PSTs attempting to scaffold learning. However, the number of learning activities categorised as critical was still very low. One explanation for the lack of critical learning activities is that the PSTs could not effectively differentiate between interactive and critical health literacy learning activities. Another explanation for the low number of critical learning activities could be that the PSTs were unable to develop learning activities to support critical health literacy skills in sun safety education due to inexperience and the limited time frame of the three lessons. This begs the question as to whether more than three lessons is needed to effectively develop critical health literacy skills in sun safety education.

Frequency of Activities

In re-examining the original data set, further categorical analysis showed that only nine out of the 30 PSTs introduced one or more activities that were deemed as being critical health literacy. Further to this, additional analysis showed that eight of these nine PSTs had mobilised interactive health literacy activities effectively in either the first or second lesson. This analysis indicated that less than one third of the students were able to progress the level of health literacy from the first to third lesson as per the hierarchy of health literacy (Nutbeam, 2000; 2008).

Of the 21 PSTs who had not mobilised a critical health literacy activity or activities by the third lesson, one PST had not mobilised an interactive health literacy activity or activities. This PST was deemed to have mobilised only functional health literacy activities. The remainder 20 of the 21 PSTs showed progression from functional to interactive activities

across the first two lessons, suggesting that these PSTs were aware of the complexities of health literacy and the need to scaffold educational concepts to support health literacy skill. Given more time such as the inclusion of an additional two lessons, these PSTs may have mobilised critical health literacy activities in their sun safety lessons.

Conclusion

Adolescence is a significant period for skin cancer prevention; however, research suggests this age group can resist sun protective action to place themselves at risk of developing invasive melanoma both as a young person and in later life (Barwood et al., 2017; CCWA, 2018; Williams et al., 2011). In addition, schools and ITEIs are ideally positioned to positively influence and impact upon adolescent behaviour in and planning for activity that exposes them to UVR.

The ability of PSTs to mobilise and work with health literacy as an educational tool in sun safety education and lesson planning was the focus of this current research. This study had three aims and involved three phases of data collection and analysis. The first phase focused on the PSTs knowledge of the UV Index and sun behaviours, with data collected via a pre- and post-intervention survey (Barwood et al., 2017). Data indicated that the PSTs initial knowledge of the UV Index was poor but improved following the sun safety intervention by the CCWA. Furthermore, their overall confidence to apply and use the UV Index in their own life improved. The second phase of the study focused on the identification of content inclusions to support PSTs and teachers delivering sun safety education in schools (Barwood & Jones, 2019). Insights from this phase of the study were particularly useful for teachers, curriculum planners, schools and health promotion organisations like the CCWA who are grappling to respond to the implementation of new curriculum. Insights from the second phase of the study also indicated that the freely available SunSmart website was a significant resource of information for the PSTs, with emergent themes and/or content inclusions reflecting the drop down menus on the SunSmart website.

The third phase of the study aimed to create understandings of PSTs ability to mobilise and work with health literacy in sun safety education as per AITSL's Graduate Standard 2 and Graduate Standard 3 (2011b). More particularly, with adolescent students in Year 7 of schooling. The results indicate an unequal spread of activity type with the PSTs planning more functional activities than interactive or critical activities. Analysis suggests that not all PSTs have appropriate understandings to develop learning that progresses students from a functional to a critical level of health literacy in sun safety education and as per Graduate Standard 3 (AITSL, 2011b). Therefore, PSTs require more training at ITEIs to promote their mobilisation of critical health literacy skills in learning for young people regarding sun protective behaviours. More importantly, they could benefit from specific training to facilitate critical health literacy across health education more generally.

As the number of PSTs who were able to implement critical health literacy activities in lesson planning was low, this may also suggest that teachers, delivering health education currently in schools may also benefit from professional learning to increase their mobilisation of critical health literacy activities in lesson planning. This correlates to AITSL's identification of the significance of engagement in professional learning as per Standard 6 and Standard 7 more generally (2011b). The research suggests that professional learning that focuses on ways to develop all three levels of health literacy is warranted with both pre-service, practicing and experienced teachers.

Although the analysis of data in Phase 3 of the study did not include an analysis of the resources that were made available to the PSTs in the conduct of this research, the insights from phase two of the study (Barwood & Jones, 2019) suggest that an examination of freely

available sun safety education resources is warranted. Such an analysis would be of benefit to organisations providing resources for schools, teachers and educators. This analysis could indicate that there is a lack of resourcing that promotes critical health literacy in sun safety education.

In concluding this research, the authors strongly advocate that ITEIs and organisations preparing resources for use in schools, pay greater attention to supporting the development of health literacy skills in children and young people as doing so could ensure that the level of critically health literacy in the population is improved. More significantly and in the context of this research, specifically promote the mobilisation of health literacy in sun safety education to help reduce the incidence of skin cancer and potentially save lives. Therefore, and by providing some insight with regard to the disjunction between adolescents' high level of knowledge and poor sun protective practices, and in examining ways to support critical health literacy skill in young people, this research has evidenced that there is more to be done in preparing PSTs to effectively work with curriculum. In the case of the PSTs at the ITEI in WA, to specifically increase their understandings and uptake of the five propositions underpinning HPE in Australia in their teaching and learning, and strengthen their ability to cultivate safer, healthier and more physically active living in the young.

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