

# The use of animations and the 'teach-back' technique to facilitate an understanding of health literacy levels within the general community.

## ABSTRACT

Studies in Australia (1-3), the United States of America (4) and the United Kingdom (UK) (5, 6) show that less than half of all adults in these developed countries have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions. It is therefore imperative that new health professionals have a clear understanding of the health literacy levels within the community and how to effectively communicate health messages to individuals with low health literacy.

This paper/ presentation describes a scaffolded activity to promote an understanding of healthy literacy amongst undergraduate students and uses the 'teach-back' technique to enhance communication and understanding. The activity comprised of 4 key components; research the health literacy of the target audience through the use of a survey and subsequent literature review, construction of a storyboard and written audio script for a slowmotion animation to communicate the health message, construction of a slowmotion animation and ultimately gaining feedback on the animation from the target audience.

Both qualitative and quantitative data were used to assess the learning. Quantitative differences resulted from cumulative scores of the 4 assessed components in each of the sub-activities. The students' individual evaluations were also graded based on the Structure of the Observed Learning Outcome (SOLO) taxonomy (7).

One hundred and three students enrolled in a 4th year Nutrition and Therapeutics course for Pharmacy students completed the 'health literacy' activity. Over 90% of the students demonstrated relational reasoning or extended abstract reasoning suggesting deep learning had occurred; the mean score for the evaluations was 4.4±0.6 using a SOLO 'scale' which varied ranging from a score of one assigned for prestructural reasoning and a score of 5 for extended abstract learning. These grades correlated significantly for the cumulative grade for the 4 part assessment

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of 75%+12.1% ( $p<0.000$ ). Males performed more poorly than females on the SOLO scores for their individual evaluations ( $4.2\pm0.7$  vs  $4.5\pm0.5$ ;  $p=0.017$ ), with a trend to a difference in the overall scores ( $73\pm12\%$  vs.  $78\pm8\%$ ;  $p=0.06$ ). Age and residency status did not affect these relationships. These high levels of deep learning were supported through their personal evaluations and descriptions of how their learning impacted on their personal and future professional lives.

The findings suggest the use of a preliminary survey and literature review established the foundation for the creation of storyboards and audio-scripts, which in turn facilitated the creation of a 3 minute duration 'slowmotion animation', to improve the knowledge of disease prevention in the community. The use of the 'teach-back' technique allowed the pharmacy students to evaluate and then reflect on how effectively they communicated their health messages. This activity is likely to yield similar results in contexts where undergraduate students need to communicate scientific messages within the general community.

## Introduction

As medical advances increase at an astronomical rate, increasing pressure has been placed on health care professionals to convey the advances in a meaningful way, so that they can be easily understood by all members of the public and health consumers can be able to access this information and services (8).

For this to occur successfully there is an assumption that health professionals will possess the necessary skills to deliver health messages effectively, and for the general public to possess a minimum level of 'health literacy' to interpret these messages and take an active role in the self-management and prevention of chronic disease (9).

The World Health Organisation defined health literacy as 'the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions' (10). This definition is based on functional health literacy, interactive health literacy and critical health literacy (11) and requires 'cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health' (12).

While there are numerous tools to assess health literacy, most national and international surveys show that a maximum of half of all adults in developed countries have adequate health literacy levels to meet the requirements of everyday life; this includes Australia (1, 2), the United States of America (US) (4) and the United Kingdom (UK) (5). Causal pathways between limited health literacy and health outcomes include race, ethnicity, age, education, occupation,

employment / income, social support, culture, language, vision, hearing, verbal ability, memory and reasoning as they have been shown to impact on an individual's ability to access and utilize health care, the quality of patient – provider interactions and self-care (13).

Individuals with minimal levels of health literacy have a much lower probability of achieving and maintaining optimum levels of health (14). There is a large body of evidence which suggests that poorer health outcomes across a number of indicators were associated with low literacy levels (15); lower literacy levels typically correspond to lower levels of knowledge about personal health conditions, failure to attend appointments, low levels of compliance with health behaviour advice and medication regimes which result in high rates of hospitalisation and health service expenses (16). Individuals with low health literacy are also likely to have a low self-efficacy and are less likely to be involved in the medical decision making process (17). Unfortunately, this ultimately results in elevated rates of morbidity and mortality for most major diseases (2, 16). This implies that adequate health literacy goes far beyond one's ability to follow directions on pharmaceutical packaging, but rather facilitates self-empowerment and self-efficacy, which in turn shape lifestyle decisions. It is therefore

imperative that health professionals understand the prevalence of low health literacy within the community, how health literacy levels impact on self-care and ensure that any health information conveyed to clients is done so in a manner that is readily understood (3).

## Conceptual context

The majority of interventions to address poor health literacy have focused on rewriting health related material and pamphlets at a lower reading level (18) or educational strategies to improve comprehension (19, 20). As reviewed by Pignone et al. (2005), very few studies have evaluated the effects of interventions to increase the use of health services or reduce disease incidence or prevalence (21).

Fostering health literacy means ensuring individuals are empowered to fully understand health information and take steps to facilitate lifestyle changes to improve their health and access appropriate services when required. Traditionally health information has been delivered in print format. This has the advantage of providing a tangible resource which can support verbal communication. However, many print resources are written at a level that is too complex and too long for the average consumer to comprehend, resulting in poor health outcomes (21). A study by Houts et al (2001) demonstrated that when visual aids were used with print materials or when combined with oral discussions, the comprehension increased by as much as 71 % compared to participants who were not supplied with visual handouts (22). In addition, clients with limited health literacy consistently report pictures and images improve understanding and ultimately adherence to medical regimes and lifestyle changes (23).

Irrespective of the aids used, the use of the 'teach back' technique help students understand how to ensure they have effectively communicated scientific message in undergraduate medical and nursing programs (17, 24, 25). The 'teach back' technique involves explaining the concept, assessing the client's recall of the concept, then clarifying and providing a further explanation and assessment of the client's recall and comprehension. Health care professionals also need to confirm the information conveyed orally is fully understood through open ended questions, interactive communication strategies and asking the client to 'teach back' or reiterate the key components of the discussion. This approach should then provide the healthcare professional with assurance that the client has fully understood the information discussed. The aim of this study was to increase awareness of 'health literacy' in undergraduate health science students and the impact it has on members of the general public accessing care, the quality of that

care, their personal safety and health outcomes. We aim to achieve this by initially asking students to survey members of the public to assess their knowledge of a given diet-disease relationship. Then using 'clear language' they will develop an innovative multimedia resource or animation of 3 minutes duration to educate the public based on the public's conceptions/ misconceptions and using the 'teach-back' technique resurvey to re-evaluate understanding. We hypothesised that

- a) students were generally unaware of low literacy levels within the community
- b) animations and the 'teach-back' technique would be an effective tool in creating an awareness of communicating scientific messages to individuals with low health literacy

## METHODS

### Subjects

The sample was composed of 103 Pharmacy students enrolled in a fourth year Nutrition and Therapeutics course at an Australian University. The 4.5 unit course was taught over 4 weeks and comprised of 8 lectures and 8 tutorials, all of 2 hour duration. There was an expectation that the course would equate to 180 hours of study conducted both in and outside of the classroom. The first hour of the first tutorial was dedicated to exploring health literacy and communication methods and a subsequent 2 hour tutorial dedication to the production of an animation. Students were required to work in groups of 4 and chose one of the following scenarios,

- Osteoporosis in elderly men and women (> 70 years) living in their own homes.
- Osteoporosis in men aged > 50 years living in a lower SES area.
- Osteoporosis in men and women living in a residential care facility.
- Vitamin D deficiency in young Muslim women

### There were 4 key components of the activity and assessment;

1. research the 'health literacy' of the target audience of approximately 20 people through the use of a survey and subsequent literature review (occurred out of class)
2. construction of a storyboard and written voice over for an animation (occurred out of class)
3. construction of an animation (occurred in class)
4. show the target audience the animation and survey their understanding of the diet disease relationship (occurred out of class)

The aim of the initial survey was to provide students with an understanding of general knowledge within a target audience of diet disease relationships and any other factors such as cultural factors, gender, socioeconomic status, self-efficacy, response-efficacy, educational background, languages typically spoken and motivation to change which may influence the way they should convey their scientific message. A subsequent literature review should then reinforce their findings and form the basis of their animation. Students received written feedback on this activity before progressing to constructing a storyboard.

A storyboard was used to define the parameters of their 'message' within available resources and time, organize and focus the 'message' and determine the resources required for each part of the story. Construction of a written script also ensured the presentation ran for no longer than 3 minutes. Feedback was provided by the tutor before the animations were produced. Students were asked to attend a 2 hour tutorial having produced a storyboard and script and having selected appropriate pictures and backgrounds for their animations. Numerous beads, pipe cleaners, plasticine, scissors etc. were provided. The animation was produced using standard Windows software (moviemaker), a camera from a mobile phone and standard Microsoft headphones. The method for producing the videos is described elsewhere (26). The animations were checked for accuracy and misinformation by the tutor before the next phase of the activity. This was essential to ensure there was no unintended harm to a potentially vulnerable group within the community. At the completion of the activity students were required to return to their target audience, and using the 'teach-back' technique, evaluate the comprehension and understanding of the scientific message delivered in the animation and submit a formal evaluation of their learning.

Both qualitative and quantitative data were used to assess the learning. Quantitative differences predominantly resulted from cumulative scores for the initial and final surveys, the literature review, story boards and voice overs and the students' personal evaluation. As students received no formal training in animations, only 5% of the final grade was allocated to the final product. However, features of an exemplary animation included a focus on the target demographic, the role of physical activity, diet and supplements in meeting nutritional requirements, consequences of combining supplements with other medications, recommendations regarding sunlight exposure, the guidelines for identifying those at risk, and the consequences of an advanced disease state.

The students' individual evaluations were graded based on a marking rubric developed using 5 levels corresponding to the Structure of the Observed Learning Outcome (SOLO) taxonomy (7). The SOLO taxonomy is a tool for analysing the structure of the student's response to describe the quality of learning outcome which has been applied in tertiary education in a broad range of applications (27). It has five main outcome categories which include pre-structural, uni-structural, multi-structural, relational and extended abstract reasoning (28). Students were allocated a marks based on these categories with one mark allocated to 'pre-structural reasoning' and a maximum of 5 marks corresponding to 'extended abstract reasoning'. The lower three levels have been classified as surface levels of learning, whilst the top two levels were classed as deep learning levels.

Descriptive statistics including the mean and standard deviation (SD) were calculated using the software IBM SPSS Statistics 20 (IBM Corp., Armonk, NY, USA, 2011, version 20.0). A one-way ANOVA was employed to determine statistical differences between the SOLO reflective score and the overall score for the activity. Pearson's correlation coefficient was computed to identify correlations between the overall score and the SOLO reflective score. Partial correlations were also performed adjusting for residency status, gender and age.

## RESULTS

### Demographics

One hundred and three students enrolled in a 4th year Nutrition and Therapeutics course for Pharmacy students completed the 'health literacy' activity. The mean age of the students was 23.1±2.6 years. Sixty two students were female and 41 male, while 33 were international students and the remainder domestic students.

### Quantitative findings

Overall, students appeared to engage with the activity and achieve a deep level of learning with a mean score for the evaluations of 4.4±0.6 of the SOLO 'scale'. These grades correlated significantly for the cumulative grade for the 4 part assessment of 75%±12.1% ( $p<0.000$ ). All students achieved a pass for the activity with a minimum grade of 54%. More importantly, only 6 students did not achieve deep learning for their evaluations. Forty seven per cent of students displayed 'relational reasoning, while a further 47% achieved 'extended abstract reasoning' for their evaluations. Males performed more poorly than females on the SOLO scores for their individual

evaluations (4.2+0.7 vs 4.5+0.5;  $p=0.017$ ), with a trend to a difference in the overall scores (73+12% vs. 78+8%;  $p=0.06$ ). Age and residency status did not affect these relationships.

## Qualitative findings

Undergraduate students training to become Pharmacists were amazed at many of the misconceptions within the general community. The initial survey revealed a number of older community members believed that orange juice was a good source of calcium. Further exploration of this misconception revealed that many individuals believed that calcium and vitamin C 'do the same thing, were 'interchangeable', or at the very least, both started with 'C', so they must be 'similar'. Many young Muslim women suspected they were low in Vitamin D, but only thought it would be a problem for them personally when they were 'older', for example in their 50's and none knew how to check their vitamin D levels.

The final survey also highlighted a small number of deficiencies in the manner in which the scientific message was delivered, particularly around the way portion sizes of food were described. Nutritionists and Dietitians typically describe portion sizes in terms of common measures such as cups, table spoons, tea spoons and the like. One group chose to ignore this feedback from the academic staff and described portion size in terms of 'grams'; the participants in their target group grew up using pounds and ounces and could not relate to metric measurements. In another example, Italian immigrants with low levels of English described many of their measures as nut size (walnut, hazelnut) or in terms of handfuls. Cups and the like were not meaningful measures.

Generally speaking, members of the community positively responded to the activity and the animations; many commented that the animations were both informative and entertaining. Pre and post survey data for all groups revealed an increase in the knowledge of the key concepts of osteoporosis and the role that diet can play in preventative health, although in a limited number of cases there were still misnomers. As one of the tasks was to ask the students to design their own pre and post questionnaires specific to their chosen scenario, it was not possible to standardise and quantitate the survey findings across the whole class.

Perhaps the most evocative data comes from the students' evaluations, with many describing how they intend to incorporate their new found understanding of healthy literacy into both their personal and professional lives.

## Student 1

"It gave me a better understanding of why my mother was diagnosed (with osteoporosis) and my grandmother did not. In the past both of them had to work really hard every day in the sun because of family needs. However my grandmother ate more ... dairy foods since she came to Australia, while my mother did not as she lives in Vietnam and these products are not their main food intake. My mother's daily meals were always rice and soup. She cannot eat dairy as she has.... gastric problems. This activity is helpful for me to manage my mother's condition as I now understand which fish and vegetables to encourage her to take".

## Student 2

"Now I get it! I am Vietnamese and have not traditionally consumed dairy as part of our daily diet. I now know why so many Vietnamese are crippled in old age. I have sent the video link back to my friends and a pharmacy in Vietnam and when I graduate want to go back and change this for all these people. I have also started eating more fish, green leafy vegetables and dairy and exercising more myself".

## Student 3

"Working in a pharmacy and dealing with many direct sales of calcium and vitamin D supplements to the elderly, I held a biased belief that many elderly people had a sound knowledge of osteoporosis and its prevention.... This activity really grabbed my attention, highlighting the pharmacist's responsibility and need to address and improve health literacy of customers. As a pharmacy assistant, I found myself addressing a fail old lady who claimed she was unaware of supplements or their contribution to bone health. I was very ecstatic to have completed this task and be able to provide her with more knowledge in an appropriate way. Most importantly, it was the personal satisfaction of playing a part in increasing the health literacy of an individual, and the opportunities through customer interaction to find and address gaps in their knowledge"

The last example comes from a personal email to the course co-ordinator after the assessment was complete.

"I offer our most sincere appreciation and gratitude for the opportunity to run the Health Literacy project. As Muslims ourselves, it wasn't until this project that we are fully aware of the issue of vitamin D deficiency in our community (young Muslim women). This project has also brought a great impact in delivering and communicating this issue to young Muslim women as the message was delivered from one Muslim woman to another Muslim woman.....We

highly hope that this project will continue in future years to benefit the juniors and most importantly, to the community. We are very proud to report approximately 80 women at the mosque have now had blood tests to determine their vitamin D levels”.

## CONCLUSION

To the best of our knowledge, this is the first activity to use slowmotion animations to promote a greater understanding of the issues associated with low health literacy to undergraduate students, and improve the knowledge of dietary related disease prevention within the community. Overwhelmingly, more than 90% of the students reported the activity impacted significantly of the personal and future professional lives, suggesting deep learning had occurred, as was evidenced by their final assessment grades and personal evaluations; one student stated she was committed to returning to Vietnam at the completion of her studies to educate her community on preventative health for osteoporosis. Others acknowledged the low level of health literacy within the community and changed their communication strategies to ensure the messages they were trying to convey were fully understood.

The key facets of experiential learning are a ‘willingness to be actively involved in the experience, possess and use analytical skills to conceptualize the experience, possess decision making and problem solving skills in order to use the new ideas gained from the experience and be prepared to reflect on the experience’(29). One of the strengths of this study was the use of experiential learning; students had to physically go out into the community and gain an understanding of the level of knowledge (of a given diet-disease relationship) within the community and this formed the foundation for the construction of the slowmotion animation. Undergraduate students drawing near the completion of their studies have a good grounding in the body of knowledge underpinning their profession. They also appear to lose sight of the fact that not everyone else shares that same level of knowledge. The students in this study appeared to have had ‘light bulb’ moments when their initial survey revealed members of the community used vitamin C and calcium interchangeably. The dialogue and ensuing conversation that followed between class mates challenged their preconceptions of the level health literacy within the community, and proved to be more powerful than the results of any peer reviewed published Australian health literacy survey, or in fact anything any of the lecturers or tutors could have

said pertaining to health literacy levels in Australia. McCathy and McCathy concur with this approach and report experiential activities are among the most powerful teaching and learning tools available (30).

Others have reported that reflection is a crucial part of the experiential learning process, particularly when a phase of the learning results from the actions intrinsic to experiential learning, and the opportunity to learn from the feedback of that process (31-33). This creates an opportunity to scaffold further learning, facilitating further experiences and reflection (34). The findings from this study support this; the series of activities around the creation of the animation allowed the students to gain an understanding of the health literacy levels within the community and their misconceptions, create a slowmotion animation to overcome the misconceptions and then re-evaluate the knowledge in the community after education via an animation using the ‘teach-back’ technique. While most students reported their animation was a very successful tool in communicating the scientific message and educating the community, others reported the teach-back technique revealed further misunderstandings around food measures and food /meal portion sizes. Again this gave students the opportunity to reflect on their own misconceptions.

A strength of this study was the use of SOLO taxonomy to quantitate cognitive learning. It has been used in numerous tertiary settings to describe the structural organisation of knowledge and to measure students’ learning. It is believed that as a learner moves up the taxonomy scale and moves from prestructural, unistructural or multistructural reasoning to relational and extended abstract reasoning, the more they demonstrate a deeper level of learning due to ‘more integrate and meaningful’ learning (7, 27).

One may argue the requirement to survey only 20 people in the community may have led to a bias in sample size. While this may be the case, and numerous potential misconceptions were never eluded, the level of deep learning achieved by the majority of the students would suggest that this small sample size was enough to ensure that all undergraduates learnt that the level of health literacy in the Australian community was generally low.

In conclusion, the use of a preliminary survey and literature review established the foundation for the creation of storyboards and audio-scripts, which in turn facilitated the creations of a 3 minute duration ‘slowmotion animation’, which then improved the knowledge of disease prevention in the community. The use of the ‘teach-back’ technique allowed

the undergraduate health science students to evaluate and then reflect on how effectively they communicated their health messages. Furthermore, this activity is likely to yield similar results, in a variety of contexts within the general community, where undergraduate students need to communicate scientific messages.

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