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Abstract: The development of healthy eating habits in adolescents is challenging. Resultantly, health educators are turning to digital devices to engage young people in nutrition education. This paper focuses on the development and evaluation of a computer game (Test Game B) to support healthier food choices. Test Game B was developed at an Australian university and trialled with 72 tertiary student volunteers along with a control game (Control Game A). Both games provided information related to the progression of food along the digestive tract with knowledge of digestion, nutrition, a healthy diet and attitudes to food choice measured before and after game use. Change in these indicator variables assessed game effectiveness. The study found that the transformational aspects of problem-based learning within a digital context can support healthier food choices in young people, whilst pre-service health education teachers may require learning in food digestion to support nutrition education in schools.

Introduction

Australian dietary survey research indicates that the adolescent age group have the least healthy eating habits of all Australians (Australian Bureau of Statistics, 2015), with two-fifths of the food intake of 14-18 year olds reported to derive from discretionary foods that are high in fat and/or sugar. A plethora of evidence also relates poor nutritional intake as a significant factor contributing to obesity, type-2 diabetes and other non-communicable chronic diseases in the adult population (Commonwealth of Australia, 2010; Melaku et al., 2018). Spear (2002) advocated that intervention with this age group was critical to support optimal nutrition for adolescent growth but more importantly, to promote optimum health and performance across the life span. More recently, the focus has shifted toward the development of food and/or nutrition education in primary and secondary schools, to support healthier food choices and promote healthier living from an earlier age (Hunter et al., 2017).

Schooling is recognised globally as an important setting to educate for and about healthier food choices and to support healthier dispositions in children and young people (Author, 2017; Mukamana & Johri, 2016; World Health Organization, 1997, 2003). School curriculum is identified as the framework that enables food and nutrition education to be delivered in an age appropriate sequence (McBride, Midford, & Cameron, 1999). In Western Australia (WA), food and nutrition education outcomes are directly identified within the curriculum learning areas of Health and Physical Education (HPE) (School Curriculum and Standards Authority[SCSA], 2015) and

Technologies (SCSA, 2016). However, there is scope to include food and nutrition focused education in other learning areas such as the Sciences and Humanities. As with any curriculum policy documents, the achievement of learning outcomes depends largely on the approaches used to engage and motivate students (Archambault, Janosz, Fallu, & Pagani, 2009). Teachers, therefore, are charged with the responsibility for interpreting curriculum text and selecting ways in which to facilitate learning and engage young people in positive learning outcomes (Author, 2017). Initial teacher education institutions (ITEIs) are responsible for preparing pre-service teachers with curriculum and content knowledge, pedagogical and praxis knowledge, understandings of children and young people, whilst also exploring teaching resources suitable for use in schools.

Research shows that today's youth have unprecedented access to digital technology and interactive media (Barab, Pettyjohn, Gresalfi, Volk, & Solomou, 2012), with computer games proving to be popular amongst the adolescent age group. In 2010, 42% of Australian 12-14 year olds and 33% of 15-17 year olds reported playing computer games regularly (Thomas & Martin, 2010). By way of contrast, in 2017 eight out of 10 young people aged 8-17 self-reported playing games online (Australian Government, 2018). Research also suggests that supporting a favourable learning environment through the use of digital technologies can promote active learning, build knowledge, engage and motivate students, support higher level thinking and increase learner independence (Newhouse, 2015, 2017). Furthermore, digital technologies are well suited to specific learning areas like Science, Technology, Engineering and Mathematics (Li & Tsai, 2013; Masek, Boston, & Lam, 2017) but offer additional learning possibilities to other areas that may struggle to engage learners (Casazza & Ciccazzo, 2007; Hoelscher, Evans, Parcel, & Kelder, 2002; Papastergiou, 2009).

A meta-analysis conducted by Vogel, Vogel and Cannon-Bowers (2006) demonstrated the attractiveness of digital technologies as a legitimate learning context by concluding that students who used digital games showed better results in cognitive outcomes and attitudes towards learning than those who were taught with traditional approaches. Of similar significance, Rebetez and Betrancourt (2007) and Young et al. (2012) found that digital technologies support social, emotional and cognitive outcomes in young people, whilst Annetta, Minogue, Holmes and Cheng (2009) found that the lessons learned in the digital context tend to be retained by students. Therefore, it is unsurprising that computer games, especially the problem-based learning found within these games are of increasing interest to teachers who are seeking to enhance student understanding and engagement across a range of learning areas. The challenge for teachers lies not with the use of such games, but to find games that are suitable or fit for purpose (Silk, Sherry, Winn, & Keesecker, 2008). At times, this task can be time consuming and confusing.

The Digital Education Advisory Group (2013) recommend that computer games for school-based learning need to be educative and contain instructional opportunities that appropriately address curriculum outcomes. Blumenfeld, Kempler and Krajcik (2006), advise that to increase the motivation of students, they need to see value, they need to have a feeling of being in control and competent, and the game should involve a positive interaction element with teachers and fellow students. Further, the key to an effective educational game is that the motivation should relate intrinsically to the learning content. As was observed by Garris, Ahlers and Driskell (2002), motivation to play an educational game can come from factors either intrinsic or extrinsic to the educational content. As shown by Habgood and Ainsworth (2011), however, a close integration of learning content into the gameplay leads to better learning outcomes than merely using the gameplay as an extrinsic motivator with learning content separated from the gameplay. Unfortunately, many educational games continue to separate gameplay and learning, primarily from a development perspective this option has lower cost. A game that combines gameplay and learning to achieve specific learning outcomes is known as a transformational game and few have been developed or trialled in the area of nutrition education (Barab et al., 2012; Baranowski et al., 2003; Majumdar, Koch, & Gray, 2015; Masek, Murcia, Morrison, Newhouse, & Hackling, 2012).

This paper reports on a study at an Australian university that investigated the use of transformational games to engage young people in healthier food choices, game player knowledge of nutrition and the design and evaluation of a transformational game as a pedagogical device for nutrition education. The specific research questions were:

1. What was the impact of the developed game on the users' knowledge of diet, nutrition and biology concepts as related to the human digestive system?
2. What was the impact of the developed game on the users' attitudes and intentions related to eating a healthier diet?
3. What was the user experience when playing the game?
4. What changes could provide a more engaging and enjoyable experience?

Method

Study Participants

Although the test game was intended for adolescent school students, it was tested in a convenience sample of tertiary student volunteers (n=102), most not long out of high school to examine player interaction and game play, understandings of nutrition concepts and variations in player knowledge by gender and course studied. These participants were assigned either into a control or intervention group. Out of the student volunteer group, 72 participants completed the experimental procedure in full. The 72 participants were derived from:

- Non-health Science students (n=21) whose course was unrelated to nutrition education and derived from courses focused on computer science and tourism science. The majority (56%) were second year students.
- Secondary Education students (n=30) whose course had some relation to nutrition education. These students included pre-service secondary teachers of Home Economics who were in their second and third year of the course. The remainder were Health and Physical Education pre-service teachers in the third year of their course.
- Health Science students (n=21) whose course was directly related to nutrition education. These students were enrolled in nutrition or nutrition bioscience majors and comprised first, second and third year students although the majority (76%) were in their second year.

Ethical Approval

Approval to conduct the study was gained via the university's Human Ethics Research Committee. Participants provided informed online consent before commencing the trial.

Instruments

Control Game A

Control Game A is a publicly available online interactive animation (http://kitses.com/animation/swfs/digestion.swf). It was specifically selected because it contains similar concepts to Test Game B by focusing on the processes of digestion and the digestive system. In Control Game A, the game player selects a food and observes the processes associated with the movement of food from the mouth to the anus, including aspects of physical and chemical digestion of food.

Test Game B

Test Game B was designed and developed through the collaborative efforts of a multi-disciplinary team, including research expertise in nutrition, curriculum policy and pedagogy, educational design and computer game design. Over the course of 12 weeks, a group of student software developers worked iteratively with the research team to test and refine the concepts present in the game. Core game design aims included:

- Interactivity, where the player had a high level of control over the game;
- Nutrition choices that were relevant to the player;
- Immediate feedback on the impact of a nutrition choice in the form of gameplay experience, rather than text;
- Factual explanations of what was happening in relation to the nutrition choice; and
- A story line that would show the benefits of changing nutrition choice from unhealthy to healthy.

Test Game B was built into an existing game world, Nanocity (Murcia, Newhouse, & Boston, 2018). The player takes the role of a nutrition scientist, whose adolescent clients are seeking nutrition advice, an example of a case is shown in Table 1.

Case Brief: Matt (14 Years Old) Slept in, so quickly grabs what he can from the fridge for his school lunch. Lunch contents: Salami sandwich with white bread.

Table 1: Example client profile

The player guides a small robot through a simulation of the client's digestive system and at various points has the opportunity to substitute the food that was ingested (with three options presented) to observe the impact at that point. The game is purposefully designed, such that poor nutrition choices cause impediments to the progress of the player. For example, Figure 1 shows progress blocked by constipation, where selection of a meal with more fibre can unblock the way.

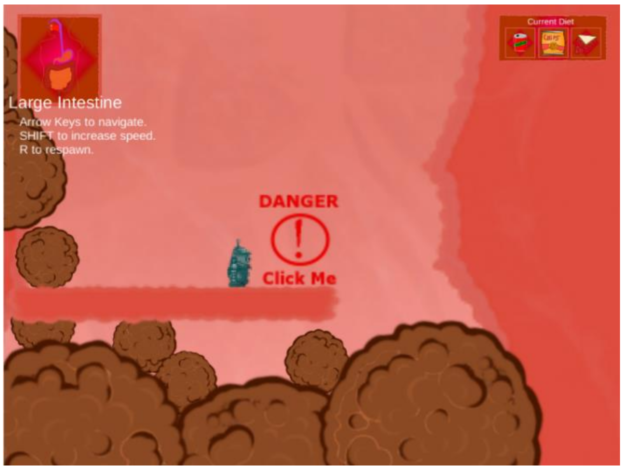

Figure 1: Game progress blocked by constipation

Procedure

Prior to game trialling, participants completed an online information and consent form and the pre-survey; where the last question required selection of either game based on the first letter of their surname. This process enabled random allocation of participants to either Control Game A or Test Game B. Following the game play, the participants completed a post-survey. The pre and postsurveys contained the same questions to determine their knowledge of nutrition and digestion concepts, and attitudes and intentions towards diet, health and making healthy food choices. The pre-survey collected demographic data and the post-survey included an additional feedback section to determine experience of playing the game and attitudes towards it.

Survey and Indicator Scores

Three knowledge and two attitude indicator scores were calculated from participant responses to the pre and post-survey items. The items, scoring and maximum possible values for each score are shown in Table 2.

Digestion Knowledge Score (5 items[a], maximum score=15)
In which part of the digestive tract does most carbohydrate digestion occur?
Which organ is least involved in fat digestion?
Which of the following is not a role of dietary fibre in the gut?
Which of the following is not involved in chemical digestion of foods?
In which part of the digestive tract does most nutrient absorption occur?
Body Food Use Knowledge Score (4 items[a], maximum score=12)
Which nutrient is essential to provide energy to the brain?
In which part of the body is glucose stored as glycogen for a quick energy source?
Which part of the body is the main storage site for food energy not used by the body?
When blood glucose rises after eating and/or drinking, what does the pancreas release?
Healthy Food Choices Knowledge Score, (3 items[a], maximum score=9)
If a person wanted to decrease sugar in their diet, what would be the healthiest drink choice?
If a person wanted to increase fibre in their diet, what would be the healthiest snack choice?
If a person wanted to decrease fat in their diet, what would be the healthiest lunch choice?
Attitudes to Food and Drinks Score (5 items[b], maximum score=30)
I will feel more energetic if I eat wholegrain instead of white bread.
What I eat and drink can make a difference to my chance of getting a disease like diabetes or cancer.
I will have a healthier body if I don't eat processed snack foods and drinks.
I will prevent myself gradually gaining weight if I eat plenty of fruit and vegetables.
I will improve my overall health by drinking mainly water.
Future Food Choice Intentions Score (7 items[b], maximum score=42)
In the future, I will pay attention to eating plenty of vegetables every day.
In the future, I will pay attention to eating fruit every day.
In the future, I will pay attention to always choosing foods low in fat.
In the future, I will pay attention to always choosing drinks low in sugar.
In the future, I will pay attention to always choosing whole grain breads and cereals.
In the future, I will consider how much nutrition my meal and snack choices will provide me.
I feel confident to choose foods and drinks which are healthy as well as tasty.
Additional questions
Post-trial Game Attitudes Score (7 items[b], maximum score=42)
Overall, this is an interesting game.
I enjoyed playing this game.
It is easy to navigate in the game.
The interface of the game is user friendly.
The information presented in the game is credible.
The information presented in the game is personally relevant to me.
I learned a lot from this game.

[a]Each item allowed choice of answer from 4 options or Don't know. Correct answers scored 3, partly correct scored 1.
[b]Each item asked *How much do you agree or disagree with the following statements?* (Responses on 7 point Likert scale from Strongly Agree (7) to Strongly Disagree (0)).

Table 2: Pre-post-game trial survey question items per score

Data Analysis

Statistical analysis was conducted using SPSS, Version 25.0 (IBM Corporation, 2017). Demographic details of the game trial participants were compared using cross tabulation and independent Chi-squared test. Changes in mean indicator scores pre- and post-game trial were compared between test and control game groups and between courses using repeated measures Generalised Linear Models (GLM). Mean post-trial Game Attitude Scores were compared between test and control game groups and between courses using univariate ANOVA. Due to small sample sizes, adjustment in GLM and univariate ANOVA models was limited to course, game played and interaction terms for gender with course and game played. Adjusted means are presented in tables of results but for brevity are referred to as means in the text. For GLM and ANOVA tests, Bonferroni adjustments were made for multiple comparisons and significant differences were defined at $p<0.025$. Otherwise for cross tabulations significance was defined at $p<0.05$.

Results

Participant Demography

There were more Education participants (n=30) than from any other courses of study (n=21) but their distribution was not significantly different across the games played ($p>0.05$). There were twice as many females (n=49) than males (n=23) and a significant difference in distribution of gender across courses ($p<0.05$) such that more male participants were enrolled in the Non-health Science course and less in Health Science ($p=0.002$) (see Table 3). This difference was significant for participants who played game B ($p=0.007$), but not game A.

Game	Course	Gender		Total	Sig*
		Male	Female		p
Control Game A	Non-Health Science students	5	5	10	0.197
	Education students	2	10	12	
	Health Science students	3	10	13	
Total		10 (28.5%)	25 (71.5%)	35 (100%)	
Test Game B	Non-Health Science students	8	3	11	0.007
	Education students	4	14	18	
	Health Sciences students	1	7	8	
Total		13 (35.1%)	24 (64.9%)	37 (100%)	

*Significance level derived from cross tabulation and Chi-squared test.

Table 3: Difference in participant gender by course enrolment (n=72)

When asked, most participants (61.1%) responded they spent less than five minutes per week playing computer games. About one quarter (23.6%) said they played between 5 and 60 minutes per week whilst a small proportion (15.3%) played computer games for more than an hour per week. These participants were more likely to be male (81.8%, $p<0.001$) and studying Non-health Science (72.7%, $p<0.001$).

Almost all (90.4%) Health Science participants and about 60% of the remaining participants agreed or strongly agreed they think a lot about the health aspects of the foods and drinks they consume. In contrast, a quarter (23.8%) of Non-health Science participants but less than 10% of the remaining participants disagreed or had no opinion. Overall, these differences were significant between courses studied ($p=0.026$) but not between genders within courses.

Knowledge Scores
Digestion Knowledge Score

Mean Digestion Knowledge Score of all participants pre-game trial was 55% of the maximum possible score of 15. This was not significantly different between the Control Game A and Test Game B and there were no significant changes from pre- to post-trial in either game group overall or within course groups (Table 4). In participants of both games pre-trial, Health Science participant mean scores were significantly higher than Education (p=0.021) and Non-health Science participant mean scores (p=0.005). Post-trial these differences were not significant (Table 4).

Course	**Control Game A**		**Test Game B**		
	Pre-	Post	Pre-	Post	Sig [d]
	Digestion Knowledge Score (maximum possible score=15)				
Non-health Science	6.27 ±1.10 [b] (n=9)	7.49±1.20 (n=9)	6.69 ±1.08 [b] (n=9)	7.91±1.19 (n=9)	NS
Education	7.01±1.13 [b] (n=12)	7.94±1.24 (n=12)	7.43±0.97 [b] (n=18)	8.37±1.07 (n=18)	NS
Health Sciences	11.09±1.14 (n=13)	11.33±1.25 (n=13)	11.51±1.32 (n=8)	11.76±1.46 (n=8)	NS
Total	8.12 ±0.77 (n=34)	8.92±0.84 (n=34)	8.54 ±0.79 (n=35)	9.35±0.87 (n=35)	NS
	Body Use Knowledge Score (maximum possible score=12)				
Non-health Science	6.53±0.88[b] (n=9)	4.70±0.93[b] (n=9)	5.91 ±0.88[b] (n=9)	5.40±0.92[b] (n=9)	NS
Education	7.29±0.91[b] (n=12)	6.40±0.96[b] (n=12)	6.67±0.79[b] (n=18)	7.10±0.83[b] (n=18)	NS
Health Sciences	10.66±0.92 (n=13)	10.40±0.97 (n=13)	10.03±1.07 (n=8)	11.10±1.23 (n=8)	NS
Total	8.16 ±0.62 (n=34)	7.16±0.65 (n=34)	7.54 ±0.64 (n=35)	7.87±0.67 (n=35)	NS
	Healthy Food Choices Knowledge Score (maximum possible score=9)				
Non-health Science	7.80 ±0.25 (n=9)	7.40±0.30 (n=9)	7.93 ±0.24 (n=10)	8.27±0.29 (n=10)	0.004
Education	7.95±0.26 (n=12)	7.57±0.31 (n=12)	8.08±0.22 (n=18)	8.43±0.27 (n=18)	0.004
Health Sciences	8.31±0.26 (n=13)	8.23±0.32 (n=13)	8.44±0.30 (n=8)	9.10±0.37 (n=8)	0.004
Total	8.02 ±0.18 (n=34)	7.74±0.21 (n=34)	8.15 ±0.18[c] (n=36)	8.60±0.22[c] (n=36)	NS

[a]Adjusted in GLM models for game, course, gender and interactions of gender with Game and Course.
[b]Within group mean values with the same superscript are significantly different from the mean value of the Health Sciences Course, p<0.025.
[c] Within group total mean values with the same superscript are different between pre- and post-game test, p<0.025.
[d] Between Group, Post Game Test Difference.

Table 4: Adjusted[a] mean±SE knowledge scores by course, game played and pre- and post-game

Body Food Use Knowledge Score

Mean Body Use Knowledge Score of all participant pre-game trial was 65% of the maximum possible score of 12. There were no significant differences in mean Body Food Use Knowledge score overall between game allocations before and after gameplay (Table 4). For participants of both games, Health Science participant mean scores were significantly higher than Education and Non-health Science participants both pre-game trial (p=0.018 and p=0.006 respectively) and post-trial (p=0.003 and p=0.001 respectively) (Table 4).

Healthy Food Choice Knowledge Score

Mean Healthy Food Choice Knowledge Score of all participant pre-game trial was 89% of the maximum possible score of 9. Pre-trial there were no significant differences between Control Game A and Test Game B participants' scores or mean scores within each course group. Post-trial the overall mean score and mean scores within each course group for Test Game B participants were significantly higher than for Control Game A participants (p=0.004) (Table 4). Overall, there was a significant increase from pre- to post-trial in the mean score for Test Game B participants (8.15 ±0.18 vs 8.60±0.22, p=0.025) but not Control Game A participants (Table 4).

Healthy Eating Attitudes and Intentions
Food and Drink Attitude Score

Mean Food and Drink Attitude Score of all participant pre-game trial was 83% of the maximum possible score of 30. There were no significant differences in mean scores between game allocations overall, nor between courses within each game, before or after playing (Table 5).

Course	**Control Game A**		**Test Game B**		
	Pre-	Post	Pre-	Post	Sig [b]
	Food and Drink Attitude Score (maximum possible=30)				
Non-Health Science	23.20±0.86 (n=10)	23.19±1.46 (n=10)	23.58±1.10 (n=11)	24.35±1.85 (n=11)	NS
Education	24.27±0.92 (n=12)	23.72±1.55 (n=12)	25.89±0.92 (n=18)	23.70±1.55 (n=18)	NS
Health Sciences	27.32±0.93 (n=13)	27.96±1.58 (n=13)	26.64±1.73 (n=8)	28.36±2.92 (n=8)	NS
Total	24.93±0.62 (n=35)	24.96±1.05 (n=35)	25.86±0.63 (n=37)	25.87±1.06 (n=37)	NS
	Future Food Choice Intentions Score (maximum possible=42)				
Non-Health Science	29.05±2.91 (n=9)	29.58±2.89 (n=9)	33.85±2.75 (n=11)	32.42±2.73 (n=11)	NS
Education	29.45±2.98 (n=12)	34.76±2.96 (n=12)	34.25±2.59 (n=18)	37.61±2.57 (n=18)	NS
Health Sciences	32.20±3.03 (n=13)	35.77±3.01 (n=13)	37.00±3.50 (n=8)	38.61±3.48 (n=8)	NS
Total	30.24±2.04 (n=34)	33.37±2.03 (n=34)	35.03±2.04 (n=37)	36.22±2.03 (n=37)	NS
	Post-trial Game Attitude Score (maximum possible=42)				
Non-Health Science	-	28.56±1.94 (n=10)	-	27.06±1.86 (n=11)	NS
Education	-	33.26±2.06 (n=12)	-	31.75±1.79 (n=18)	NS
Health Sciences	-	30.46±2.10 (n=13)	-	28.96±2.43 (n=8)	NS
Total	-	30.76±1.40 (n=34)		29.25±1.41 (n=37)	NS

[a]Adjusted in GLM or ANOVA models for game, course, gender and interactions of gender with game and course.
[b] Between Group, Post Game Test Difference.

Table 5: Adjusted[a] mean ±SE attitude and intentions scores by course, game played and pre- and post-game.

Future Food Choice Intentions Score

Mean Future Food Choice Intentions Score of all participant pre-game trial was 78% of the maximum possible score of 42. There were no significant differences in mean scores between game allocations overall, nor between courses within each game, before and after playing (Table 5).

Post-trial Game Attitude Score

Mean post-game Game Attitude Score was 71% of the maximum possible score of 42. There were no significant differences in mean post-game Game Attitude Score between games played, participants studying different courses or time spent playing computer games per week.

There were also no significant differences between games in level of agreement with any of the statements, which made up the score. Overall, the majority agreed that the games were interesting (73%), enjoyable (60%), easy to navigate (74%), user friendly (85%), credible (90%), personally relevant (75%) and taught them a lot (63%). When asked for any other comments about the games, participants of the Test Game B offered twice as many positive comments as participants of Control Game A. Participants described Test Game B as fun, interesting, engaging, interactive and educational, however, negative comments revealed that participants did not enjoy the long introduction to the game as there was too much reading, they were confused by the instructions and experienced some technical hitches. Control Game A was mainly described as educational; especially for children, but the participants felt it was repetitive and boring, with no mission. Participants also commented that there were limited instructions with little opportunity for interaction.

Discussion

This study investigated the use of transformational games as a pedagogical device to engage young people in healthier food choices. It examined the interaction and knowledge of three groups of tertiary students to provide insight for preparing pre-service teachers who deliver nutrition education in schools. The study specifically assessed the effectiveness of Test Game B as a pedagogical device in nutrition education.

Participants described both the test and control games as educational, but described Test Game B as fun, interesting, engaging and interactive; characteristics acknowledged elsewhere as essential for effective engagement in learning (Blumenfeld et al., 2006; Garris et al., 2002; Li & Tsai, 2013; Newhouse, 2015; Papastergiou, 2009). Despite a relatively high pre-trial score (89%) in both game groups, Test Game B was associated with a significant increase in knowledge of healthy food choices compared to Control Game A. It is important to note that despite much lower starting scores (55% and 65% respectively) there was no significant increase in knowledge about the digestive system and use of food by the body in either game group. This gives support to the findings of Habgood and Ainsworth (2011) in regard to the value of intrinsic verses extrinsic motivation. Healthy food choices were intrinsically integrated into gameplay, with the player making a choice of food and experiencing the consequences through gameplay. Conversely, information regarding details of digestion and use of food by the body was presented mainly as text, extrinsic to gameplay.

Whilst increased knowledge of healthy choices was associated with Test Game B, attitudes to food and drink and future food choice intentions were not significantly changed relative to Control Game A. The overall pre-trial scores for these indicators were also relatively high (83% and 73% respectively).

In this study, the university course of the participants was significantly associated with positive food and drink attitudes, and knowledge of digestion and use of food by the body. As expected, the Health Science participants had higher baseline scores for knowledge and attitudes than participants in any other courses, however, this did not appear to influence qualitative responses regarding the value and use of the transformational games as a pedagogical device. The lower knowledge scores of the Education students for *digestion knowledge* and *body food use knowledge* suggests that this particular cohort require specific discipline-related studies of food and body functioning to support effective nutrition education in schools. As such, ITEIs that prepare pre-service teachers who deliver this content should ensure this learning is embedded within their courses.

Making healthy food choices was the learning focus and purpose of transformational components in Test Game B, and Healthy Food Choice Knowledge score was the only indicator to increase significantly in the test group compared with control. Despite low pre-trial scores for knowledge of digestion and use of food by the body, and provision of factual information on these in both the control and test games, knowledge scores for these aspects did not change after the game. These results suggest that the transformational aspects of the problem-based challenge to make healthier food choices were an effective form of nutrition education. Coupled with greater reported enjoyment of the transformational game format we conclude that well-designed purposeful transformational games have potential for effective use in nutrition education.

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