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The impact of flipped classrooms in nurse education: A literature review

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Abstract

Flipped classroom pedagogy is increasingly being used in tertiary education including within nurse education programmes. This literature review aims to critically examine empirical published work (from 2012 to 2019) which reports of the impact of flipped classroom pedagogies on nursing students' learning and performance. Global themes identified include student performance outcomes, engagement and enhanced/diminished student satisfaction. Synthesis of the findings of this literature review indicates that in nurse education the flipped classroom supports retention of knowledge, improves performance outcomes in areas as diverse as caring and examination results and there is enhanced student satisfaction with this method of learning. Enhancements to student learning and achievement using the flipped classroom model are connected to extra time and opportunities available for development of critical thinking and complex reasoning skills in class. As well, improvements are linked to the flexibility and self-efficacy accorded to students by the provision of learning opportunities in the form of deeply personalised online support. There is also evidence to suggest that students initially find this method stressful but with tutors and faculty staff providing information and rationale for the flipped classroom approach, this stress can be reduced.

Keywords

Nursing education research; flipped classroom; teaching; nursing faculty.

Background

An approach to nursing education and research that has been gathering momentum in recent years is use of the flipped classroom. This review considers literature published from 2012 to 2019 on this topic. The pedagogical and programme innovations associated with the flipped classroom is thought to be largely in response to a call by The Institute of Medicine (IOM) for a radical transformation in nurse education. The report examined different components of the profession including the nursing workforce's ability to meet future demands of the health care system (The Institute of Medicine, 2010). The flipped classroom has been trialled as part of a move to engage student nurses as active learners,



with rich and powerful learning experiences that will prepare them for practising in a changing health care environment (Benner et al., 2010; McLaughlin et al., 2014).

Bergmann and Sams (2012) are recognised as the pioneers of flipped classroom methodology. Concerned that high school students were missing classes due to other commitments, they began using live video recordings and screen casting software to record lectures, demonstrations and slide presentations. These were posted onto YouTube for students to access and watch whenever and wherever they chose (Hamdan et al., 2013). In class, the students then completed different activities which were related to the online coursework. It was found that the students began interacting more during these classes (Bergmann & Sams, 2012). Bergmann and Sams (2012) explored three stages of activity design for flipped learning which comprised of pre-class, in-class and after class stages. In pre-class, self-directed learning is the main activity. Students can work on mastering concepts by accessing the videos and readings in their own time and at their own pace (Bransford et al., 2000; Butt, 2014; Marshall & DeCapua, 2013). The in-class stage allows time for active learning that fosters critical thinking, such as unfolding case studies, group activities, simulation and presentations, completed under the guidance of the tutor, who plays the role of advisor, mediator or facilitator. The tutor is responsible for scaffolding learning, adapting materials and activities to meet students' needs, and helping students to connect newly learnt theory to clinical practice and real patient care (Herreid & Schiller, 2013; Hung et al., 2005; Kim & Jang, 2017; Shatto et al., 2017). Problem solving through teamwork, questions, discussion and feedback is encouraged (Bergmann & Sams, 2012). Finally, knowledge application and self-evaluation occur in the after-class stage. This is where students reflect, consolidate and expand on their acquired knowledge (Kim & Jang, 2017).

The flipped learning method aligns with Bloom's Taxonomy, where students focus on the lower levels of the taxonomy (understanding and remembering) as homework that is completed before class; e.g., students can work on mastering concepts and can play the videos and readings at their own time and pace (Marshall & DeCapua, 2013). The upper levels of the taxonomy (applying, analysing and creating) are then covered in the classroom. Marshall and DeCapua (2013) believe that this allows students who are struggling to grasp a concept the opportunity to understand before they come to class. The repeated exposure to material of at least three times is known to give students a better understanding of the foundational content and how this applies to practice (Bransford et al., 2000).

Previous research has shown that traditional lectures are still a predominant teaching strategy in many parts of higher education, where passive learning in hour-long lectures can bore students and deprive them of rich educational experiences (McLaughlin et al., 2014; Mikkelsen, 2015). The purpose of this literature review is to discover what is known about the impact that the flipped classroom has on nursing students' learning and performance.

Methods

A systematic literature search was undertaken of the wide range of databases subscribed to by the University of Waikato Library in New Zealand, and Google Scholar. Boolean operators were used as conjunctions to focus search results using the following key words: flipped classroom, learning, performance, experience, satisfaction and nursing students. The inclusion criteria ensured that scholarly articles only were selected, and these were published in English within the last seven years, as the initial search showed that this was the period of most research in this particular area (2012–2019). Further literature screening was conducted by looking at the relevance of studies identified during the literature search. First, titles and abstracts of papers were reviewed that included nursing students. Second, full-text papers were reviewed in-depth. Papers were excluded if they were not empirical studies, not in English or a dissertation or thesis paper. Systematic reviews, literature and scoping reviews were then excluded, as only articles containing primary research were wanted.

The initial scoping using the key words and inclusion criteria obtained 205 hits. Further screening for relevance and application of exclusion criteria narrowed the review to 24 articles. A further hand search of references within these articles and a Google Scholar search led to an additional seven different articles being found. At this point saturation was reached as any additional searches did not discover

new articles that matched the criteria. A full-text review of the 31 papers was conducted to determine if they were suitable for inclusion. The articles were tabulated against descriptors such as study purpose, design and setting, course and flipped classroom intervention characteristics and reported themes (Appendix 1). Articles were systematically synthesised and summarised. Data included author(s)/year of publication, country of origin, aim, research design, sample population, data collection, methods of analysis and reported outcomes.

Study characteristics

Twenty-three of the studies were conducted within Undergraduate Bachelor of Science Nursing programmes, two within Associate Degree programmes and two within graduate programmes. Three papers focussed on an Accelerated Bachelor of Science and one on a medical degree. The final study was conducted in an Undergraduate Dietician/Nutrition course. Content areas ranged from paediatrics, adult health, learning disability nursing, pharmacology, simulation, anatomy and physiology, medical and surgical nursing, psychiatry, gerontology nursing, dietetics and nutrition, maternal and child health, population health and community health. The majority of literature in this field was from the United States of America (USA) making up 60 percent (18) of the total. There are two research articles from Australia, three from Korea and one from each of the countries; Egypt, Indonesia, Iran, United Kingdom, New Zealand, Denmark, India and Canada (see Table 1).

Table 1. Paper Country Distribution

Source of papers	Number of papers from source
USA	18
Korea	3
Australia	2
Egypt, Indonesia, Iran, UK, NZ, Denmark, India, Canada	1 from each country

Most studies involved mixed-methods research. Many reported shifts in examination results (El-Banna et al, 2017; Greenwood & Mosca, 2017; Hanson, 2016; Holman & Hanson, 2016; Singla et al., 2016), employing structured surveys pre- and post-intervention with a combination of both or either open-ended questionnaires and focus groups. Descriptive statistics were used to report shifts in scores or satisfaction ratings and inductive thematic analysis used to identify emergent themes (Gilboy et al., 2015; Peisachovich et al., 2016; Saunders et al., 2017; Telford & Senior, 2017; Yacout & Shosha, 2016). Common approaches included experimental techniques such as quasi-experimental or randomised controlled trials (Dehghanzadeha & Jafaraghaeb, 2018; Geist et al., 2015; Greenwood & Mosca, 2017; Holman & Hanson, 2016; Kim & Jang, 2017; Lee & Park, 2018; Maxwell & Wright, 2016; Shatto et al., 2017; Singla et al., 2016). A few authors (Mikkelsen 2015; Mills et al., 2017; Post et al., 2015) conducted studies that were primarily exploratory or phenomenological, reporting on students' experiences and perceptions of the flipped classroom.

Sample sizes ranged from smaller studies ($n < 20$ e.g., Hermanns et al., 2015; Saunders et al., 2017) involving perceptions of clinical tutors or faculty staff to larger student cohort studies ($250 \leq n \leq 600$, e.g., Holman & Hanson, 2016; Missildine et al., 2013; Saunders et al., 2017), with a median of 76 participants. The duration of interventions ranged from single-semester (Green & Schlairet, 2017; Mikkelsen, 2015; Yacout & Shosha, 2016) to year-long (Choi et al., 2015; Kim & Jang, 2017; Tune et al., 2013), to comparison of cohorts across two or more years of study (Posey & Pintz, 2017; Sari et al., 2017; Shatto et al., 2017).

Results and discussion

Following the final full-text review of the 31 articles, the following high-level themes and sub-themes were identified:

Performance outcomes

- Enhanced examination or formal assessment results
- Enhanced clinical skills
- Student participation and engagement

Student satisfaction

- Enhanced satisfaction
- Diminished satisfaction

Of these 31 articles, 16 focussed on performance outcomes. Eleven of these studies reported improved exam/performance results with the flipped classroom method and five reported no changes. Of the 11 studies with improved performance outcomes, four also had improved student satisfaction (Greenwood & Mosca, 2017; Kim & Jang, 2017; Rodrigues, 2016; Tune et al., 2013) whilst five had reduced satisfaction despite having improved exam results (El-Banna, 2017; Hanson, 2016; Missildine et al., 2013; Peisachovich et al., 2016; Tune et al., 2013). One study reported both diminished and improved satisfaction (Tune et al., 2013). Three of the 16 studies did not discuss student satisfaction as part of their research (Sari et al., 2017; Shatto et al., 2017; Singla et al., 2016). Of the five studies who reported no change in performance outcome, three of these still showed improved satisfaction (Geist et al., 2015; Holman & Hanson, 2016; Posey & Pintz, 2017), and two did not measure satisfaction.

The literature relating to these themes and related sub-themes will be described and synthesised. Some studies are discussed separately and in detail as exemplars.

Performance outcomes

A number of studies have been undertaken with the main question focussed around differences in content or conceptual knowledge gained when students undertake a course in traditional classes or learning compared to the flipped classroom. Results are evidenced in student achievement and outcomes of summative assessment. This focus is incorporated in the first global theme: *Performance outcomes*. This is further divided into three sub-themes: *Enhanced examination or formal assessment results*, *enhanced clinical skills*, and *student participation and engagement*.

Enhanced examination or formal assessment results

Use of flipped classroom approaches were found to have resulted in a statistically significant improvement in terms of percentage points from examination or assessment results in experimental studies (Greenwood & Mosca, 2017; Kim & Jang, 2017; Missildine et al., 2013; Peisachovich et al., 2016; Singla et al., 2016; Tune et al., 2013). For example, Singla et al. (2016) divided 73 nursing students on a pregnancy course into two groups. Both groups were taught the same content but with the flipped classroom group, study material, videos, links and images on the topic were available 24 hours prior to class. Knowledge was assessed immediately after and retention memory seven days later. The results were statistically higher for the flipped classroom group in both tests. Results from Greenwood and Mosca's (2017) study of female undergraduate nursing students in a medical/surgical course revealed the highest first-time pass rate in many years (93%) using flipped classroom approaches (n=215). It is believed that the flipped classroom had contributed to this increase; however, there were other curricular changes made within this course. The impact of concurrent pedagogical or curricula changes resulting from implementation of the flipped classroom will be discussed further below.

Some noted inconsistencies across the programme, such as Geist et al. (2015) who reported that the students in the flipped classroom group performed significantly better on three tests during the course, although the final examination scores demonstrated no significant difference. Similarly, Holman and Hanson (2015) gathered rich data on the advantages and disadvantages of flipped classrooms but noted no difference in examination results. Simpson and Richards (2015) evaluated students' perceptions of the flipped classroom and reported that although the university course evaluations showed no significant statistical differences between the traditional and flipped classroom method, the students in the flipped classroom rated the course more positively.

Commonly, the flipped classroom cohorts in these studies received narrated PowerPoints or video lectures to view before class (Green & Schlairet, 2017; Greenwood & Mosca, 2017; Mikkelsen, 2015; Saunders et al., 2017). Active learning was encouraged in class using group-work, quizzes and case-study discussion approaches (Dabney & Mitchell, 2017; Mills et al., 2017; Simpson & Richards, 2015; Singla et al., 2016). In the experimental studies, the traditional cohorts commonly received a more traditional in-class lecture format (Dehghanzadeha & Jafaraghaeeb, 2018; El-Banna et al., 2017; Lee & Park, 2018; Shatto et al., 2017; Singla et al., 2016). Gilboy et al. (2015) redesigned a traditionally delivered nutrition/dietician undergraduate course to a blended course of 50 percent online and 50 percent face-to-face using the flipped classroom as their approach. The structure of the course consisted of before class, during class and after class activities, allowing the tutors to be more intentional and planned in their approach. The before-class work consisted of readings, taking notes and watching lectures/videos from Khan Academy or TED talks and focussed on lower levels of Bloom's taxonomy. Class time was used for higher level learning, such as application, analysis and synthesis, for example, using jigsaw activities and mini summaries from each group. The after-class component built on the higher levels of learning through formative and summative assessments.

Enhanced clinical skills

Clinical placements can be daunting for students, especially in terms of their developing communication skills and confidence with intimate patient care (Saunders et al., 2017). The flipped classroom environment was thought to have impacted positively in the clinical area, with the flipped classroom supporting students' wider and deeper thinking and critical reasoning when linking conceptual knowledge to their clinical application (Hanson, 2016; Post et al., 2015). By applying knowledge and analysing content taught, students were able to demonstrate an increased level of problem-solving skills and clinical reasoning and judgement during in-class activities and in simulation. Students also demonstrated enhanced professional competence through their communication and interactions with simulated patients. Saunders et al. (2017) found the flipped classroom models positively impacted students' understanding of person-centred care, the professional nursing role and preparation for clinical placement. Key themes showed a person-centred holistic focus, a safe learning environment to learn from mistakes, opportunities to practise and develop skills and proficiency, able to apply the clinical reasoning cycle, learn from peers and develop skills in communication and teamwork (Saunders et al., 2017). Similarly, Rodrigues (2016), Shin et al. (2008) and Saunders et al. (2017) reported that using the flipped classroom model showed that students were more confident with their clinical skills, such as a focus on person-centred care, critical and reflective thinking, teamwork and communication skills.

Student participation and engagement

An important sub-theme which evolved from analysis of *performance outcomes* were aspects related to *student participation and engagement*. This theme is closely related to *enhanced student satisfaction*; however, for clarity, the two are discussed separately.

Aspects associated with *enhanced student satisfaction* included active learning, such as increased student effort and participation in pre- and post-class review of content. Similarly, increased out-of-class participation and engagement was aided by use of interactive, online digital pedagogies which supported

anytime, anywhere learning. Increased student confidence was also noted and is discussed in this section.

Active learning

Motivation for the shift to flipped classroom was commonly linked with students' difficulty sustaining interest in traditional classes and retaining the large amount of delivered content (Clark, 2014; Critz & Knight, 2013; McLaughlin et al., 2014; Mikkelsen, 2015). However, it must be noted that when reporting improvements associated with the flipped classroom, it is difficult to attribute causal effect to any single aspect of an innovation or intervention, as these are complex, dynamic environments. Notably, concurrent pedagogical or curricula changes resulting from a focus on more active learning and student participation during implementation of the flipped classroom were recognised as having an impact. For example, Tune et al. (2013) proposed that for flipped classroom cohorts, the use of homework and in-class quizzes were critically motivating factors that most likely contributed to the increase in student exam performance. Singla et al. (2016) suggested the improvement could be attributed to students spending more time than others on online learning material. Additionally, completing the pre-class work meant students were able to spend more time in class on consolidation and application of their learning via case studies, role playing, or group problem-solving activities. Simpson and Richards (2015) reported that students enjoyed case studies and that these stimulated and strengthened their critical thinking skills, particularly in relation to problems in Population Health. Likewise, class time could be used for reviewing interesting cases which had occurred in the clinical part of the course (Critz & Knight, 2013). Eighty-five percent of students in the study by Critz and Knight (2013) found that working through case studies was either extremely worthwhile or worthwhile. Students found the case studies "interesting, challenging, interactive and fun" (p. 212). Group work and working together to solve problems also contributed to increased student engagement and enjoyment. Posey and Pintz (2017) explained that students in the flipped classroom seemed more prepared and engaged in their learning, and this enabled richer dialogue because they possessed an amount of foundational knowledge to draw from. It was easier to identify those who were struggling and harder for students to hide or get lost as there was more generalised participation and the lecture was interspersed with questions and discussion. Tutors noted this had a positive influence on student attention.

Many factors related to advantages of active learning emerged from end-of-course evaluations in Holman and Hanson's (2016) study. These included student-centred instruction, improved preparation, enhanced student-instructor interactions, better use of time and increased learning. The flipped classroom model seemed to encourage more independence and accountability in learning. Students were better prepared for class as they were able to become familiar with the material. The flipped classroom was perceived as more learner-centred, with students able to watch and listen to the recorded lectures at their convenience. Students appreciated the increased application of concepts and real-world practice through class activities and assignments. They also noted that they were able to use their time more effectively, as there were fewer distractions from other students while they viewed and listened to the lectures. Students reported improved understanding of concepts, improved retention of knowledge and less "dumping" of information by tutors. One student explained: "Class time was used in a way to help us actually apply what was discussed in the lecture, so I felt I learned the information better and it stayed with me better than just being dumped afterwards" (Holman & Hanson, 2017, p. 321).

Digital pedagogies

It has been noted in sections above that students in flipped classroom cohorts were spending more time in online learning (e.g., see Gilboy et al., 2015; Green & Schlairet, 2017; Greenwood & Mosca, 2017; Mikkelsen; 2015; Saunders et al., 2017; Singla et al., 2016). In addition, it has been argued that an online

tutorial format can be used to revise curriculum and aid retention of conceptual knowledge (Choi et al., 2015; Simpson & Richards, 2015).

The use of digital platforms and pedagogies in flipped classrooms are related to active learning, as students can lead their own learning. A feature most often touted is that learning can be conducted anytime, anywhere. It should be noted that although this aspect of the flipped classroom is positioned as innovative and commonly differentiated from traditional approaches, it has long been possible to learn anytime, anywhere. For example, one can learn by taking a textbook on a bus journey. The differentials are that digital platforms and pedagogies can be interactive, customised and therefore deeply personalised (Leadbeater, 2005, 2006). For instance, Kim and Jang (2017) and Choi et al. (2015) discuss online quizzes or review sessions with 'repeat until mastery features', enabling students to learn at their own pace. Similarly, Mansur (2012) and Maher et al. (2014) note this strategy connected with improved preparedness for class and revision for examinations. Students in the study by Choi et al. (2015) stated that the flipped classroom model improved their understanding of the content as they were able to "pause and rewind the lecture videos", "search for words in a dictionary", and "take notes as needed" (p. 944).

Deeply personalised learning is associated with ideas of student autonomy, ownership and choice, where students decide what, how, when, where, with whom and at what pace they learn (Prain et al., 2013). It is this flexibility that is a strength of flipped classroom approaches and many of the articles reviewed described instances of this. Telford and Senior (2017) found that a significant percentage of students agreed that e-learning resources allowed them to be flexible in organising their learning. In the study by Hermanns et al. (2015), students liked the face-to-face learning and then being able to go back home and review content in their own time. Weekly quizzes helped students analyse their reasoning and these quizzes were also helpful in preparing them for licensing examinations, a factor which has also been reported as useful by Kim and Jang (2017). Simpson and Richards (2015) included online content which involved voice over PowerPoints, videos, interactive online modules and text readings prior to class. In-class activities focussed on gaining an understanding of population health by taking part in case studies, web quests, videos with response time and group presentations using bubbl.us and prez.com. In research conducted by Choi et al. (2015), 97 percent of first-year nursing students watched either all or almost all of the pre-recorded lectures before coming to class and 65.3 percent watched them multiple times. They also used the pre-recorded lectures to study for examinations and to re-review content that they didn't understand. In agreement with Singla et al. (2016), Choi et al. (2015) maintained that the extra time students spent engaging with course material was key to improved student outcomes.

Tune et al. (2013) surveyed student perspectives regarding the flipped classroom model. Most students agreed that they watched the lecture videos consistently before coming to class and liked being able to review the videos in their own time. They all felt that the quizzes at the start of each session motivated them to do pre-class work more than with the previous traditional method. Dabney and Mitchell (2017) flipped an undergraduate gerontology nursing course in Texas, USA. A high percentage of students (88.1%) agreed or strongly agreed (A/SA) that viewing the video lectures prepared them for in-class activities and 64.3 percent A/SA that the pre-recorded lectures were required for being successful in class. Post et al. (2015) reported that students enjoyed having the ability to view the lectures in a video format. The repetition, flexibility and ability to re-listen to the lectures were some of the benefits expressed by the students and helped with their retention of knowledge. This was helped by the students being able to increase the speed so that the total time of the lecture was less, whilst others liked being able to slow it down and listen to a concept again.

Mikkelsen (2015) focussed his Denmark study on undergraduate nursing students during a first semester course on kidney and urinary anatomy and physiology. The students made use of the ability to pause videos when desired according to their preferred pace of learning. The results of this study clearly suggest that videos used in a flipped classroom setting are of potentially great value to students. Pre-class activities included watching videos which ranged from 3 to 9 minutes, PowerPoint files containing text drawings and simple animations about kidney and urinary system anatomy and physiology. As part of the study, students' video usage was tracked using the statistics data on YouTube. The in-class activities focussed on active learning and student-centred activities, such as problem solving and

engagement in important concepts related to the videos e.g., filtration, reabsorption and secretion (Mikkelsen, 2015).

Enhanced confidence

A final aspect worth noting related to student participation and engagement is enhanced student confidence. Tutors noted that after implementing the flipped classroom students seemed more confident in executing a variety of skills and practices. Greenwood and Mosca (2017), Hermanns et al. (2015), Peisachovich et al. (2016) and Posey and Pintz (2017) remarked on an increase in student confidence when presenting to their peers. This gain was perhaps a product of active learning planned in conjunction with the flipped classroom and because time allowed for it in class and increased student participation. Improved confidence was linked to the role play strategy used to practise communication and gain understanding of a patient's situation. Dabney and Mitchell (2017) noted enhanced confidence in examination preparation and in students' confidence in their ability to pass the final examination. This is in keeping with Telford and Senior (2017), where students noted that the flipped classroom model helped them to prepare for the summative assessment. Rodrigues (2016) used online quizzes and a questionnaire to evaluate clinical skills on 60 students and reported that using the flipped classroom method showed that students were more confident with clinical skills and were able to develop their critical and reflective thinking by linking their prior knowledge over a two-year course.

Student satisfaction

The second high-level theme is student satisfaction. Two sub-themes will be discussed below: Enhanced student satisfaction and diminished student satisfaction.

A number of the flipped classroom studies selected for this literature review reported enhanced student satisfaction with the flipped classroom method of learning (Choi et al., 2015; Critz, 2013; Dabney & Mitchell, 2017; Geist et al., 2015; Gilboy et al., 2015; Hanson, 2016; Holman & Hanson, 2016; Kim & Jang, 2017; Mikkelsen, 2015; Greenwood & Mosca, 2017; Posey & Pintz, 2017; Post et al., 2015; Rodrigues, 2016; Saunders et al., 2017; Simpson & Richards, 2015; Telford & Senior, 2015; Tune et al., 2013; Yacout & Shosha, 2016).

A similar number (Choi et al., 2015; Dabney & Mitchell, 2017; El-Banna et al., 2017; Gilboy et al., 2015; Green & Schlairet, 2017; Hanson, 2016; Holman & Hanson, 2016; Mills et al., 2017; Missildine et al., 2013; Post et al., 2015; Simpson & Richards, 2015; Peisachovich et al., 2016; Telford & Senior, 2015; Tune et al., 2013; Yacout & Shosha, 2016) reported diminished satisfaction due to issues such as time pressure, frustrations with the model, finding the new programme disruptive or stressful or overwhelming, or because students were resistant to change. Some reported instances of both (Dabney & Mitchell, 2017; Gilboy et al., 2015; Hanson, 2016; Holman & Hanson, 2016; Posey & Pintz, 2017; Simpson & Richards, 2015; Telford & Senior, 2015; Yacout & Shosha, 2016). Some authors, such as El-Banna et al. (2017), Hanson (2016), and Missildine et al. (2013), found that although students learning with the flipped classroom method performed better in examinations, they had a lower level of satisfaction. In some studies instances of negative reporting of student satisfaction made up 50 percent or more of the student group (Goff, 2011; Green & Schlairet, 2017; Mills et al., 2017). Interestingly, Green and Schlairet (2017) looked at whether an individual learning type influenced students' feelings about the flipped classroom model. Kinaesthetic learners reported positive feelings about the flipped classroom model; visual learners reported negative feelings whilst the auditory learners were independent of feelings about the flipped classroom model.

Enhanced satisfaction

Enhanced satisfaction ratings in the flipped classroom were associated with aspects of active learning, digital pedagogies, and enhanced confidence, as reported above.

Interactive activities, such as individual and small group exercises, case studies, discussions and role playing that shifted students from passive to active participation, were linked with enhanced student enjoyment or satisfaction (Post et al., 2015; Saunders et al., 2017; Yacout & Shosha, 2016). Having access to the course content prior to class meant students could prepare questions for aspects they found difficult to understand, and this had a positive impact on student satisfaction (Choi et al., 2015; Hanson, 2016; Maher et al., 2014). Repetition, flexibility and the ability to re-listen to the lectures were some of the benefits that increased student satisfaction. Other factors were the ability to digitally increase lecture speed so that the total time of the lecture was less, whilst others liked being able to slow it down and listen to a concept again (Post et al., 2015). For example, statistical data from an online survey in Saunders et al (2017) showed significant differences in overall student satisfaction (79%) and after implementing the flipped model (91%), whilst the focus group and open-ended survey data revealed further information about student satisfaction. Key themes connected to enhanced satisfaction were person-centred holistic focus, a safe learning environment to learn from mistakes, opportunities to practise and develop skills and proficiency, able to apply the clinical reasoning cycle, learn from peers and develop skills in communication and teamwork. Gilboy et al. (2015) redesigned a traditionally delivered nutrition/dietician undergraduate course to a blended course of 50 percent online and 50 percent face-to-face using the flipped classroom as their approach. Results from analysis of Likert scale surveys and two open ended questions from 196 students showed that 76 percent preferred watching the video lecture rather than the face-to-face lecture for the topic, and 64 percent of the students would rather participate in the in-class activities than listen to the lecture. Over two-thirds of the students felt that they learned the material more effectively by viewing the online recorded lecture; however, this was not quantified by testing the students with exams.

Diminished satisfaction

Factors connected with diminished satisfaction include perceived increased stress due to heavier workload, lack of preparation, student need for tutor contact, and quality of technology or digital pedagogies.

A common challenge was some students arriving in class unprepared, having not watched videos or completed pre-class readings. This meant students were unable to participate and interact in class, and this was frustrating for peers and tutors alike. Tutors were presented with the dilemma of whether to carry on or spend more time than they otherwise might reviewing material so that those who were unprepared were not left behind (Gilboy et al., 2015; Holman & Hanson, 2016; Telford & Senior, 2017). Electronic attendance through e-learning platforms can be one way of monitoring off-site participation. Attaching completion of pre-class work to assessments is another effective way of encouraging students to engage (Telford & Senior, 2017).

A key reason for diminished student satisfaction was related to the move from a familiar, traditional method to the flipped classroom method (El-Banna et al., 2017; Goff, 2011; Green & Schlairet, 2017; Mills et al., 2017; Yacout & Shosha, 2016). The change to active learning, while positive, may still be disruptive to students who are more used to passive or more teacher-centred models. Studies covering diminished satisfaction also highlighted that student satisfaction improved with time, as course designers made improvements following feedback and as students acclimatised to different expectations for how they might use their learning time at home and in class (Greenwood & Mosca, 2017; Peisachovich et al. 2016; Tune et al., 2013).

Some of the dissatisfaction with the flipped classroom method was related to the requirement that students prepare for the in-class activities. Increased workload and preparation time can have a positive effect on exam results but can also increase stress and lead to students feeling overwhelmed (Goff, 2011; Mills, 2017). Students in studies by El-Banna et al. 2017, Choi et al. (2015), Holman and Hanson (2016) and Peisachovich et al. (2016) reported mostly positively on the flipped classroom model; however, many found the increased time and academic effort required to watch lectures and study for quizzes before class to be stressful. These extra demands were seen to be the main shortcoming of the flipped classroom method. Two studies found that students studying pharmacology wanted to be taught the

subject, not learn it themselves (Hanson, 2016). Sams and Bergmann (2014) clarified that not all content lends itself to flipping and courses that have large amounts of factual content can be one of these examples. Some students in Simpson and Richards' (2015) study reported difficulty staying organised without lecturer contact every week, whilst others thought that the quizzes were challenging and did not see the importance of completing them prior to class.

Despite improved exam results, most students had a relatively low level of initial enthusiasm for the flipped classroom method in the study by Tune et al. (2013). This dissatisfaction came from the increased workload and the fact that they did not think that their effort reflected the number of credits. By the end of the course, approximately half of the students had increased enthusiasm, while the other half indicated continued or worsened dissatisfaction. These problems can be remedied if course designers are realistic about what is required of students outside of class and communicate clearly the out-of-class course commitments at the outset (El-Banna et al., 2017; Mills et al., 2017).

One cause of increasing anxiety was if students were unable to have questions answered or get feedback on their pre-class work in a timely manner (Choi et al., 2015; Gilboy et al., 2015; Hermanns et al., 2015; Post et al., 2015; Telford & Senior, 2017; Yacout & Shosha, 2016). Blackboard, Moodle and Q&A forums were suggested by Green et al. (2016) as a way to overcome these problems. However, learning to use new technology can be challenging for some students and this needs to be considered when planning activities. Videos that were too long to hold student attention or had quality issues were found to be frustrating (Choi et al., 2015; Gilboy et al., 2017; Hanson, 2016; Holman & Hanson, 2016; Mikkelsen, 2015; Post et al., 2015; Yacout & Shosha, 2016), but this was easily resolved by rerecording the content and reducing length (Post et al., 2015).

Conclusions

The literature reviewed reveals a wealth of positive research results to suggest that the impact of the flipped classroom improves nursing students' performance outcomes in terms of examination or assessment results and clinical skills. The flipped classroom is strongly associated with enhanced student satisfaction as well as increased student confidence, participation and engagement, being aligned with pedagogies of active, personalised learning, and exploiting digital tools and technologies which support student autonomy and ownership. However, there can be issues with implementation and methods resulting in diminished student satisfaction and increased stress, which this review has highlighted. These issues can be addressed by tutors and faculty staff as they prepare and plan for a flipped classroom implementation, and student satisfaction ratings can improve over time as systems are established and students adapt.

The studies that focussed on student satisfaction highlighted common positive themes when implementing the flipped classroom, which included improved understanding and retention of knowledge. This was mainly due to students being able to watch the pre-class videos until they understood the content, and before applying this new knowledge to case studies and activities in class. Students seemed to enjoy the balance between in-class and online activities and felt that this combination led to their effective learning. Students were also able to apply their learning from pre- and in-class activities to their clinical placement learning, where they were reported to have developed wider and deeper critical thinking skills in some studies and also more confidence in communication, teamwork and skill development and proficiency. Tutors and other faculty staff additionally reported an increased level of problem-solving skills and clinical judgement, during in-class activities and in simulation.

Results from studies reviewed were generated from comparisons of outcomes before the introduction and immediately following implementation of the flipped classroom method. This is a factor worth investigating further. A recommendation from this literature review is that longitudinal study would be of benefit so that the longer-term performance outcomes and retention of knowledge associated with the flipped classroom can be seen more clearly. A limitation noted in many of the studies was that students did not receive any or received only brief explanations of the flipped classroom teaching methodology. This meant they did not necessarily understand the rationale for, or benefits of, the change. This can be easily rectified for future courses instigating the flipped classroom. Further,

curriculum designers must be aware that not all content lends itself to flipping and that students value all value tutor contact and active, expert teaching. Therefore, a flipped classroom programme needs a balanced variety of learning opportunities.

Finally, it is suggested that central to the flipped classroom model is the provision of interactive, customised and flexible online materials that can be visited and re-visited by students anytime and anywhere. More recent world events, including the global pandemic, illustrate the importance of access to and quality of online learning materials. Ultimately, the focus should be on making online learning as useful as possible to students in order to increase their self-efficacy towards learning.

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