

Table 1.*Details of included studies (listed alphabetical by author)*

Author, Year, Country	Design	Summary
Aase et al., 2021, Norway	Phenomenological, qualitative, exploratory pilot study using focus-groups	This study investigates the nursing students learning experiences using podcasts, specifically podcasts on “huddles” which occur at the beginning of the shift among clinical practice students and the healthcare team. The purpose of this article was to explore the relationship between podcasts on the topic of “huddles” and how it influences learning. The participants, eleven students in their third year of nursing school, listened to podcasts on “huddles” during their practical studies at a hospital ward. Approval was sought from the Norwegian Centre for Research Data and the participants’ consent and withdrawing rights were obtained. The researchers chose to use focus-group interviews to obtain data from the participants. The results were analyzed using content analysis. The authors identified four categories across participant interviews, “understanding one’s own role in the huddle”, “being encouraged to speak up”, “the huddle as a flexible learning tool” and “being authentic but not always realistic” (p. 4). The study results showed students regarded podcasts as useful sources of information on “how to engage in interprofessional teamwork” (p.7). The results mirrored similar findings in academic research on similar topics. The researchers conclude that the flexibility of podcasts makes them a useful learning tool for students. The researchers made a concerted effort to accurately, and without bias, relay the experiences of their students. Their decision to use focus interviews as a means of data collection allowed them to thoroughly investigate their phenomenon of interest, podcasts, and learning. Furthermore, their study had good auditability, fittingness, and credibility even if they don’t address these topics specifically. The authors admit that a limitation of their study is its small number of participants.
Abate, 2013, USA	Quantitative, experimental, after-only design	The sample (n=35) of female undergraduate nursing students were divided into three groups of traditional face-to-face lectures, non-stop podcast lectures and segmented podcast lectures. The goal for this pilot study was to evaluate the effectiveness of academic podcasts on knowledge retention and application. Their definition of podcast was a “media file that is distributed over the Internet” (p. 182). Review found that students claimed the use of “technologies promoted learning... by providing opportunities for review and revision” (p. 183). Podcasts have been found to be an important resource in nursing education to “review subjective matter, reinforce material, clarify content, and facilitate notetaking” (p. 183). Podcasts are viewed as valuable but “not as a substitute for an actual class session” (p. 183). The study results found the “participants in the segmented podcast group had the highest mean scores in both retention and application assessments” (p. 185). A study limit was the sample size, and so the findings are not statistically significant. It is, however, something the authors believe that nurse educators should be aware of.

<p>Burke & William, 2014, USA</p>	<p>Pre-experimental quantitative design with convenience sampling and open-ended qualitative question</p>	<p>“[A]lthough traditional lecture continues to be the mainstay of providing content to higher education students, it is considered to be low-level learning because often students are not thinking about or processing information and instead are passive.” (p. 256). This study gave at least 101 undergraduate nursing students (juniors, seniors and non-traditional) access to podcast materials (voice with music and sound effects) which were created by the researcher and were 15min-2.5 hours in length on the topics being covered in the semester. They were made available through the university learning management system as .mov files for students to play on Quicktime. 87 students completed preintervention surveys and 101 completed postintervention surveys. 97% indicated they were able to access the materials. Two themes which emerged were students strongly indicated “podcasts facilitated their learning and allowed them time and ability to review content that was confusing or not well understood” and they would have used podcasts in previous courses and hope to have them in future courses (p. 258). Students are interested in accessing study materials outside of traditional methods and to “extend the classroom ... to ... varied settings” (p. 258). In their reasoning for their research, the authors presented three benefits of podcasts as flexibility, accessibility, and academic self-efficacy. They also presented the reasons against podcasts as sufficiency and preferability of face-to-face lectures, unsure how to access, unaware of materials, poor quality of materials or unable to access. These items are refuted by the presented data.</p>
<p>Egilsdottir et al., 2021, Norway</p>	<p>Longitudinal study inspired by participatory design using a phenomenological approach</p>	<p>The purpose of this study is to gauge Norwegian nursing students’ opinions of digital learning tools, such as podcasts. The researchers looked at how digital learning resources influenced learning of basic physical assessment skills. They used a “longitudinal study inspired by participatory design” which allowed for co-designing with the twenty-one participants who were all nursing school students (p. 1). The design included three workshops to discuss three topics of interest to this study; the third workshop discussed student’s feedback on multimedia (including podcasts) as learning materials. The Norwegian Centre for Research Data approved the study. Students’ consensus was podcasts aided in learning and promoted self-efficacy. The researchers identified seven overall themes and used student quotes as the basis for these findings. The researchers state their findings touch on previous research topics such as digital learning. However, they argue their scope of digital resources used, and use of a longitudinal design, offer new insights.</p>
<p>Fenton, 2014, UK</p>	<p>Case study design with phenomenological approach/grounded theory</p>	<p>This article outlines a project to develop, embed and evaluate a digital learning object (DLO) to expose students to the lived experience of a young person with a life-threatening condition. First, the authors state that involving children and young people in pre-registration nursing education and the development of health policies is highly effective provided their developmental stage is considered and rigorous safeguarding policies are followed. Secondly, the author explains how DLO’s can support the involvement of service users in education as they enable students to hear authentic accounts at a time and location that suits them best. Finally, they state DLO’s are especially useful as they can be reused, which decreases the burden upon lecturers. Of the DLO’s, digital storytelling has proven especially effective for capturing a unique and potentially emotionally personal narrative as it allows students to walk in the shoes of the storyteller. The DLO was designed to be highly accessible and could be viewed through mobile or computer on a variety of browsers. The subject was asked questions written by a previous cohort and answers were recorded and transcribed verbatim so the information could be</p>

		<p>provided in audible and visual format. The students were asked to rate the learning object on a Likert scale adapted from the “learning object review instrument” (LORI) and were also given the opportunity to give an additional narrative comment. 40 students completed the questionnaire with over 80% rating it as interesting, clear, and engaging. Furthermore, 90% of the students rated the DLO as highly accessible and 87.5% rated it as useful for learning. Finally, 82.5% of students rated the reusability of the DLO as useful. The narrative responses were grouped into three themes; valuing patients’ perspectives, nurse skills (e.g., it was valuable to hear the patients describe the inexperience of some nurses) and review of the DLO resource. The article concluded that DLO’s can be an effective teaching and learning strategy which allows students to develop an appreciation of the lived experience of service users. The authors also concluded the involvement of children and young people as stakeholders in service development is an emerging priority. Using a reusable DLO is a valuable way to capture the experiences of these service users before they transition into adulthood. Limitations are sample size.</p>
Marrocco et al., 2014, USA	Phenomenological – specifically Orientational qualitative inquiry using transformational learning theory	<p>This article explores the idea of incorporating podcasting into graduate nurse learning within the framework of transformational learning. This framework is essential for faculty and adult learners to create a balance for using technology. They identify the lack of research done on the use and effectiveness of podcasts. The purpose of this study was to implement the use of podcasting within graduate learning and evaluate its impact on students and faculty. Seven faculty members of adult, family, pediatric, nurse practitioner, and doctoral programs were chosen to incorporate podcast learning into their curriculum for case studies, case presentations, interviews, assessment “talk throughs”, papers, etc. Students shared their opinions on this implementation in class or via email. The majority felt that podcasting presented extra work for students as they had to listen to podcasts several times to retain the information. Technical difficulties posed as a barrier to implementing podcast learning. It was determined that overall podcasting had positive aspects and was appreciated by faculty and students. The authors identify the importance of knowing the learning needs of the specific audience and the need to incorporate different methods of learning into class curriculum. Utilizing new and various methods of teaching is essential in promoting transformational learning for both students and faculty. This article is lower in quality as it lacks many details about sampling, data collection, and data analysis. However, it identifies some key barriers and advantages to podcast learning.</p>
Meade et al., 2011, UK	Qualitative, phenomenological approach using semi-structured interviews	<p>The purpose of this study was to explore students’ experiences using podcasts as supplementary learning tools. Despite the title mentioning “non-medical prescribing students”, twenty-eight of the thirty participants were student nurses while only two were student pharmacists and these two participants were excluded from the results for having more extensive knowledge of pharmacology. The researchers selected semi-structured interviews as their qualitative design. The students were provided with podcasts of seven lectures and classified based on their podcast use from “low” to “high” users. “Data were analyzed thematically using template analysis” with themes and sub-themes (p. 3). From these themes they extracted codes which were organized in a hierarchal manner with the more common themes at the top. The project “received ethical approval from the University of Nottingham Medical School Ethics Committee” (p. 4). The results showed participants viewed</p>

		podcasts as useful for revisiting topics that were unclear during the lecture. They also enjoyed having control over when they could access this content. The main barriers identified were technological issues accessing podcasts and two participants used the podcast as a supplement for attending lectures. These findings were consistent with other studies investigating the same topics. This study is easily replicable and demonstrates good auditability, credibility, and fittingness, even if these topics aren't addressed directly. They acknowledge that the specificity of their study may be a limitation, however, in the context of this review, this is an asset.
Meek et al., 2012, USA	Quasi-experimental crossover design	This study looked at the dependent variables of student cognition (via scores), engagement (via online discussion threads), and satisfaction (via end of 8-week survey). Sample size was 15 master's-level students in health informatics course. Main summary findings were "podcasting positively influenced course satisfaction and student engagement" which then led to improving student success (p. 438). The study has analyzed data between groups, within groups, and between outcome variables (cognition, engagement, satisfaction, and overall course grade). Overall, the study found no significant differences between and within the groups across the three variables. Positive correlations were found in bivariate analysis: the highest correlation was student engagement. The second was overall posted scores under Podcasted conditions being strong, however these students also posted high scores in other areas of grading. No significant differences were found between Podcasted versus Course as Usual on overall scores or level of cognition. The study did find potential unintended consequences requiring further research as there was a drop and then rebound in scores for the Podcasted group. The hypothesized reason was this was due to students relying solely on the podcasts later in the semester. Significant positive correlation was found "as student engagement increased, students could better apply what they were learning, and overall posting scores, under both course conditions, increased" (p. 437).
Mostyn et al., 2013, UK	Mixed methods approach of quantitative and qualitative	This article focuses on the use of podcasts as an additional learning tool (alongside traditional didactic lectures) for first year nursing students learning biology. As nursing curriculum has moved away from the biomedical model and towards the social sciences and holistic care, students often feel they lack competency and knowledge in biological sciences. As the nursing curriculum is already very crowded, biological science lectures were recorded and made available to students in the form of podcasts. The students were then asked to evaluate their "usefulness for learning" through focus groups and an anonymous survey with both fixed and open-ended responses. Many respondents agreed or strongly agreed that podcasts were a useful learning tool (83%), revision aid (83%) and helped promote understanding of course materials (72%). Interestingly, many of the students stated that they used the podcasts predominantly to revisit or revise a subject/lecture as opposed to accessing the material for the first time. Students emphasized that the podcasts should only be considered as an addition to traditional lecture provision. A limitation of the study is the students who chose to attend the focus groups had successfully accessed the podcasts and therefore we do not have the qualitative information from students who chose to abstain.

<p>Nikpeyma et al., 2021, Iran</p>	<p>Qualitative descriptive study using purposive sampling and semi-structured interviews</p>	<p>The researchers set out to identify and investigate both the barriers and facilitators of using mobile devices as educational tools by undergraduate nursing students. This qualitative descriptive study used purposive sampling with maximum variability to select 22 male and female undergraduate nursing students in various semesters that had access to a mobile device and were willing to participate in the research. The data was collected through semi-structured individual interviews that lasted 45-75 minutes in an environment proposed by the student. Four main categories and 15 sub-categories of barriers to using e-learning and mobile devices in the undergraduate nursing program were identified through the study. The four main categories of barriers were: (1) barriers related to mobile devices (2) barriers related to internet access (3) barriers related to information literacy and (4) cultural-environmental barriers. Two main categories and 6 sub-categories that facilitate the use of these technologies in the undergraduate nursing program emerged from the research. The two main categories that facilitate e-learning were: easy access to information, and easy use of mobile devices. The results of this study suggest e-learning is an effective method for nursing students to learn clinical skills and to increase their nursing knowledge. However, the most important implications this research has for the nursing profession is the barrier identified as information literacy. Nursing students have access to endless resources online to support their learning but are not always sure of the validity of the content. The authors therefore suggest that theoretical and practical nursing knowledge be provided to nursing students through their courses. The limitations of this qualitative research study are the generalizability of the findings because the cultural context is specific to Iran.</p>
<p>Rogan & San Miguel, 2013, Australia</p>	<p>Community-based participatory research (CBPR) with quantitative descriptive statistics and qualitative content analysis</p>	<p>Nursing students who speak English as their second language (ESL) may be at risk for clinical practice failure due to communication difficulties. This article describes and evaluates an innovation using the technology of podcasting and vodcasting, along with classroom learning and activities, to help develop communication skills and practice readiness for first year undergraduate ESL nursing students. The participants were first year undergraduate nursing students enrolled in a subject preparing them for clinical placements. There were 300 students enrolled in 2008 and 376 in 2009. About half of each of these cohorts of study participants were ESL students from China, Korea, Nepal, and Vietnam. The participants completed surveys consisting of open and closed-ended questions. The survey evaluated the online terminology tool and use of vodcasts and podcasts during the course. Descriptive statistics were used to analyze quantitative data and content analysis was applied to qualitative data. ESL students found that podcasting and vodcasting were more helpful with feeling confident about clinical placement versus English speaking background (ESB) students. However, vodcasting was found to be slightly more helpful than podcasts due to the video component. Regardless of language background, the participants identified two similar findings regarding podcasts and vodcasts: (1) "an effective learning tool", (2) "an effective learning medium". Findings are found to be limited to one setting and cannot be generalized. Although only one third of the students used the resources in the study, it was determined there is potential in using technology to help ESL and ESB students improve clinical communication and develop competency standards required of nursing graduates and registration authorities. A blended learning strategy of a combination of technology and face to face may be useful in improving the uptake of resources.</p>

Schlairet, 2010, USA	Quantitative theory-driven assessment framework	Defines podcast as audio files. The most common use being recording of entire lectures. "In the only evaluative study on podcasting use in undergraduate health care education, a positive effect on grades was reported by a majority of students (Brittain, Glowacki, Van it- tersum, & Johnson, 2006)." (p. 529). Just 47% of the sample (n=70) accessed the podcasts, which is a limitation of the study. The authors summarize that the positive attitudes and technological skills of students can be leveraged by "building high-quality podcasts that align with students' learning goals and contexts" (p. 532). The study had an average length of podcast at 22.5 minutes, and 82% had accompanying Power-Point slide presentations (p. 530). They found in their study "[a] majority of students reported podcasts were helpful to their learning" (p. 531). Contrary to some of the concerns that exist, none of the students in the study reported listening to a study in replace of attending a lecture. Students who took notes while listening reported high testing scores. The study concludes that additional investigation is required.
Scutter et al., 2010, Australia	Phenomenological design using a questionnaire	The goal of this study was to explore how podcasts affected student's learning. The study is important because it was conducted five years after the invention of podcasts, and therefore provides early insight into the relationship between podcasts and learning. The researchers asked instructors at the University of South Australia to record their lectures from start to finish and upload this file online for student access. The participants, eighty students in a Medical Radiation program, would have access to this file throughout the entire duration of the course. The authors used thematic analysis to examine participants' responses to a questionnaire that was sent after course completion. The questionnaire used a scale by which participants could rate their experiences and allowed for responses in their own words. The researchers state "student evaluation component of the study was approved by the University of South Australia Human Research Ethics Committee" (p. 183). The themes extracted include, "clarification of material presented in lectures", "learning by listening", "useful revision before exams", and "replacing attendance at lectures" (p. 185). The results revealed that students had positive learning experiences with podcasts and most students used the podcasts together with PowerPoints to study. Most participants did attend lectures, however, a minority of those surveyed listened to the podcasts instead of attending class. This was a projected potential disadvantage for podcasts use. These findings fit in with similar research available at the time; in particular, these findings showed that many students learn while listening and completing other activities, such as housework. The authors also noted that participants reported they felt their learning was improved through re-listening to lectures, a finding which also fits into the literature at the time. The researchers concluded podcasts should perhaps be used to elaborate on key topics, rather than record entire lectures to promote student attendance. The primary critique of this study is that they didn't utilize more qualitative techniques to explore their phenomenon of interest, such as interviews with both instructors and students.
Stone et al., 2010, Australia	Hermeneutic phenomenological approach using semi-	The researchers performed this study to identify whether nursing students felt more confidence in performing specific clinical skills when video podcasts were made available to them to watch at their convenience as many times as they wanted. The researchers asked whether video podcasts can be used to engage and stimulate active and ongoing learning of 3 specific clinical skills by asking 10 second-year nursing students about their

	<p>structured face-to-face interviews</p>	<p>experiences using the provided video podcasts for the 3 identified skills. The researchers anticipated that the nursing students would report an increase in preparedness and confidence in performing the skills after using the podcasts which would in return improve their readiness to perform the skills in the real-world. The interviews were performed first after a single lab session with no use of podcasts and then after the students attended a second lab session and were provided with video podcasts. The design method of the study used Heidegger's hermeneutic phenomenology to gain a better understanding of the lived experiences of the nursing students. This method also helped to explore the students' own perceptions of self-confidence. The researchers used semi-structured, face-to-face interviews and used 12 questions as prompts to help elicit responses from the participants that related to their experiences using the podcasts and how the podcasts affected their learning. The podcasts were developed using the Mayer's Cognitive Theory of Multimedia Learning (CTML). Interviews were audio-recorded and then transcribed. The researchers used the van Manen's approach to data analysis to help identify themes and categories from the interviews that reflected the student's perceptions of their lived experiences. The researchers describe the process as dynamic rather than linear as they read the interview transcripts multiple times to identify themes and categories using the 5 actions of van Manen's thematic analysis process. Three themes emerged that showed a relation between the use of the video podcasts and the nursing students' confidence to perform the skills. These themes were: "accessibility for learning the skill"; "Preparation for learning and practice"; and "student-directed learning". From this the researchers learned the ability to access the podcasts whenever and wherever improved all respondents sense of feeling prepared and capable to perform the skills in clinical practice. The flexibility of the podcasts provided all students a sense of power to direct their own learning. However, all students also identified face-to-face learning to be a valuable guide to their success and suggested podcasts as a supplement to their traditional classroom and lab learning environments.</p>
<p>Strickland et al., 2012, UK</p>	<p>Descriptive statistical analysis of qualitative and quantitative questionnaires</p>	<p>This article evaluates and reports the experiences of introducing podcasting to a blended learning module called the Principles of Research and Evidence Based Practice in January 2010. Past research has identified that podcasts are mostly well received by students and compliment traditional learning, but do not act as a substitute. Podcasting poses some limitations which include accessibility and technical issues, along with issues about single mode format. There are theories that demonstrate the effectiveness of learning materials which utilize two modes such as speech and video. A convenience sample of two cohorts of students (n = 228, n= 233) participated in the study who were enrolled in the module. The module was a blended learning approach using WebCT for online content and 4 bi-weekly tutorial sessions to expand off of online content. Five podcasts were developed and incorporated into the online module content. Data was collected using a questionnaire made of quantitative and qualitative questions. Response rate was low as only 71 or 15% of the combined cohorts responded. Nine questions represented quantitative data which was analyzed using descriptive statistics. Thematic analysis was used to analyze qualitative data. Advantages were found to be "impact of the learning experience", "convenience" and "satisfaction" and disadvantages were related to "issues with technology". Due to the low response rate, it was unable to meet a sample that is representative of a population, however, the</p>

		qualitative analysis adds weight to the findings of this study. It suggests that there are some beneficial effects to including podcasting into learning and encourages further research into this area.
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