

Does Lynda.com's 'introduction to SPSS' course provide a positive learning experience relating to data analysis within a research methods module?

The beginnings of an exploratory study

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ABSTRACT

When embarking on a clinical degree, students imagine themselves in a clinical environment treating patients as well as learning a plethora of medical conditions to help inform practice. The modules met with the most resistance are the two research methods modules they must complete to successfully graduate. Students at the beginning of their second year cannot comprehend how a module that is very different to the general stream of clinical modules fits onto their learning curve. However, over the past academic year, I have been able to identify the reason for the resistance, which lies solely in the students' fear of statistics. In this article I discuss the implementation of screencasts as an adjunct to standard methods of teaching statistics in higher education. This particular project served as part of the completion for my Postgraduate Certificate in Education.

INTRODUCTION

Moving with the times is key, especially in module development. Thinking about development, one of the ingredients thrown into the mix is

the integration of technology in order to engage students in an increasingly technology-reliant society. The Higher Education Academy (HEA 2013) identifies the 'when, where and how' as flexible learning allows the student

KEYWORDS

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SCREENCASTS

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some autonomy in choosing aspects of their study. This choice stems from the notion of flexible pedagogy, which leads to varied delivery of approaches to learning and teaching, offering students the idea of choice. The

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integration of technology seems a fitting natural partner when thinking about flexible pedagogy, referring to 'pace, place and mode', in turn embracing the idea of blended learning – the ability to offer a variety of delivery methods appealing to a variety of student learning styles, with the additional ability of revisiting material via different mediums.

Constantly striving to offer a variety of learning mediums, I introduced screencasts into the research methods module taken by professional health sciences students. The main purpose of the screencast was specifically for students to learn basic SPSS tasks independently at their own pace. Conscious of the time needed to develop appropriate screencast, I decided to utilise the resources already available via the virtual learning environment. 'Lynda.com' is readily available to all students and staff at University of East London. It is a vast resource for independent learning for anyone striving to introduce new skills as part of improving one's personal repertoire of proficiencies and knowledge. The 'introduction to SPSS' course available on Lynda.com is divided into multiple easy steps allowing, in this case, students to follow relevant sections independently at their own pace and in their own time. Individual screencasts do not last longer than four to five minutes, which allows for quick review at any point during the course. I believe that this will form a popular new addition to the teaching and learning aspects geared towards positive student engagement with the statistics element of the module. One further point to introduce is that research methods is taught during the second term, in which students spend the first five weeks out on clinical placement. This considerably reduces the teaching time but not the volume of learning required to pass the module. The element of Lynda.com, having the ability to learn alongside the face-to-face elements of the course, allows for the integration of all learning outcomes for successful completion of the module.

This project will be the start to integrating technology into the research methods module utilising Kurt Lewin's model to implement change. The first spiral in this cyclical model serves more as a pilot, to get informal feedback from students in terms of their first experiences of the Lynda.com platform. If the feedback is positive, I hope to further integrate the online 'introductory SPSS' course on Lynda.com as a permanent feature within the research methods module.

WHAT IS ACTION RESEARCH?

Kurt Lewin first introduced the concept of action research in the 1940s before it migrated to Britain from the US in the 1970s. Termed as an appropriate and effective way to integrate research into teaching practice, action research has been successfully applied by 'teachers as researchers' in primary and secondary teacher education in various countries (Baird 1988; Rudduck 1988). Within higher education, the action research model reflects an ongoing need for continuous cyclical processes geared towards improving practice, as a means of integrating theory and practice. This notion emulates our clinical degree structure, where students are continuously expected to translate theory into practice and reflect upon their

actions for continuous improvement and development.

Several interpretations of action research have evolved over the years and this has led to the development of various theoretical models or frameworks used (Lewin 1952; Kolb 1984; Carr & Kemmis 1986). Action research is very much a tool for self-reflection of practice. Kemmis & McTaggart (1988) insist that this should be collaborative to improve educational practices. Throughout time, action research has received criticism with regard to its rigour and the training of those conducting action research (Stringer 2007). Kinsler (2010) discusses the use of action research as a tool for critical reflection rather than being reflexive, steering away from action research being merely a method. The bulk of the literature is geared towards a reflective process rather than a critical evaluation of the innovation which may evolve from conducting an active inquiry. The collaborative notion which should be at the centre of the inquiry is critiqued in the literature, as most work is completed using a single cohort by an insider inquirer (Kemmis & McTaggart 1988; Adler 2011; Zambo & Isai 2012; Cornelissen & Van den Berg 2013). Inquirers are believed to adopt a position whereby the world can be seen from different perspectives and where making improvements to practice

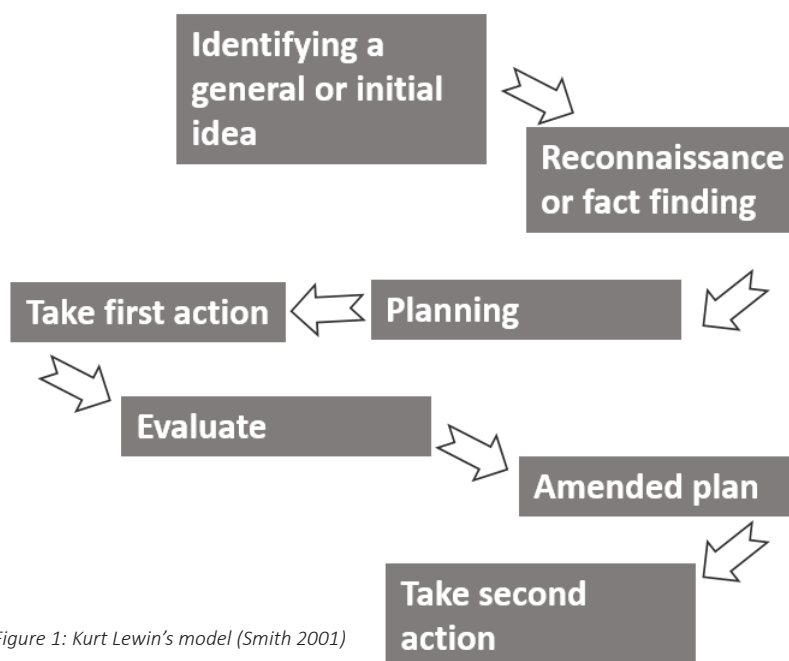


Figure 1: Kurt Lewin's model (Smith 2001)

viewpoints. The idea that transpires is that as an inquirer we do not have set viewpoints but rather explore the outcome, whatever this may be, through action research. This underpins an interpretivist epistemology.

Action researchers believe, or adopt a position which says, the world can be seen differently from different perspectives. They try to understand and make improvements to practice in an environment where there are many points of view. Action researchers do not start out with the opinion that there is one way of seeing the world and their research can discover this. These underpinning beliefs fit with an interpretivist epistemology. Thinking about my positionality in terms of my teaching alignment to the theory of constructivism, we find the idea of interpretivism to be linked to the same school of thought in terms of epistemology. Both approaches involve understanding the world through interpretation. However, how this aligns with the interpretivist approach to action research may vary slightly in how we approach questions in order to find answers.

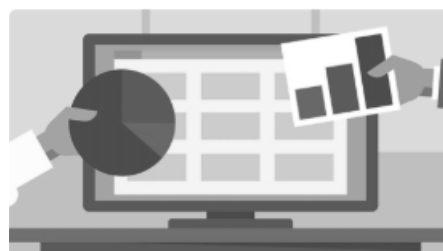
Action research is not a linear process; it follows a cyclical pattern. Various theoretical models exist; these share commonalities in terms of the implementation phases. The general patterns involve some form of planning step, an action step implementing change, followed by a review. It is this basic outline that generates learning and new knowledge for the enquirer. The various models or frameworks mentioned above will have individual ways of breaking down each phase into smaller steps; this will make these unique to their founders. Sometimes referred to as active inquiry, it is intended to serve one's own practice. It should not only benefit stakeholders such as the students but also benefit us as the educator and the wider academic community. Developmental practice involves both action research and models of reflection. Although

similarities exist between the two, action research is a more formal and thoroughly planned approach with an aspect of data collection. This is executed less often than reflective practice.

For this active inquiry, I chose to use Kurt Lewin's model. As per Lewin (1952), action research is a learning process, more specifically a cyclical process of ongoing spirals of cycles of enquiry. The cycles consist of systematic planning, acting, observing and reflecting. This is illustrated in Figure 1.

Lewin's model draws from his work on field theory, which draws on the group dynamic to understand why individuals within the group may elicit certain behaviours. Translating this idea across to action research, the emphasis is on positive change, which can only be effective if executed at the group level, as this is a collaborative process (Lewin 1947; Allport 1948; Bargal et al. 1992; French & Bell 1995).

Action research in a sense is an open-ended developmental process, commonly described as a methodology. McTaggart (1996) argues that action research is not a method but more a series of commitments and principles for conducting an enquiry. Furthermore, he alludes to Lewin's model having been misused, whereby Lewin's idea of action research was more used to contrast between interpretative practice and empirical research (McTaggart 1996). Reflecting further on the choice of model, Lewin allows for more of a visual methodology that I am able to adapt to coming from a scientific background. It further encourages the notion of open-endedness, not starting out with a specific viewpoint and allowing the spirals to define and evolve the enquiry organically.



RECONNAISSANCE – STEP 1 IN LEWIN'S MODEL

Some institutions still focus on primarily scheduling face-to-face sessions, whereas others have adopted a mix of delivery methods, incorporating the idea of blended learning as a winning combination of face-to-face, as well as offering some online material (Millichap & Vogt 2012; Brown 2013). In terms of evaluating which methods are best, the results seem to be mixed. Lack (2013) and Wu (2015) both systematically reviewed the literature with meta-analyses, resulting in little systematic difference in performance outcomes.

Even though we live in the digital age, it is useful to reflect on the type of students that are enrolled on our degree programme, especially as a professional health care programme such as podiatry will attract a substantial age range of applicants. The reason for this is that podiatry seems to be a pivotal transitional degree, whereby students embark on a secondary, alternative career path. Therefore, as part of building a case introducing elements of flexible pedagogy, incorporating blended learning through the use of screencasts, it is important to reflect on the issue of satisfaction with online learning. Research indicates some mixed results. Several papers have shown through qualitative research, using focus groups and interviews, that although the student population may be inclined to prefer a didactic teaching approach to begin with, over time this attitude changes (Kenny 2002; Reime et al. 2008; Kaveevivitchia et al. 2009; Gerdpraset et al. 2010). Kenny (2002) found that students eventually voice a desire for change in terms of more online learning opportunities. Jeffries (2001), Kim et al. (2003), Kaveevivitchia et al. (2009), Gerdpraset et al. (2010) and McMullan et al. (2011) illustrate that students report higher satisfaction from online learning. By contrast, some research by Reime et al. (2008) has shown positives in online

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learning, with students describing the experience as exciting and interactive, while some students felt that only utilising online learning platforms was a disadvantage compared with a mix of delivery. Jang et al. (2005) and Gega et al. (2007) reported no differences between delivery methods, in terms of student satisfaction with these. Further studies reported on some alternative outcomes in relation to online learning in conjunction with time spent on engagement, the effect of age in terms of online resources, as well as the time element for educators to produce online material. Reime et al. (2008) found that older students performed worse than younger students; this is very much a pertinent point to reflect upon. As mentioned previously, the podiatry cohorts have a varied age range. It is important to make sure that an even balance is achieved in the delivery, accounting for a range of students' learning styles, not related solely to age but also learning disabilities. In terms of the time spent engaging in learning, Jang et al. (2005) and Reime et al. (2008) found no significant differences. Furthermore, Kenny (2002) touched upon the time element of material production, alluding to not only the time needed but also the expertise of educators in producing online material.

The learning of statistics through the adoption of technology has been shown to contribute to positive changes in content, course format and pedagogy (Chance et al. 2007). However, large gaps exist between learning theory and teaching practices, as shown by Fernandez et al. (2009) who discuss the evident gap surrounding technological innovations research directed at university students. Furthermore, there is a paucity of empirical research specifically within the context of teaching statistics linked to the impact technology has on this (Fernandez et al. 2009; Hew 2009; Garfield & Ben-Zvi 2007). Zieffler et al. (2008) go beyond the undergraduate course, alluding to problems relating to preparing researchers

at graduate level, in the area of statistics. There seems to be a striving to find a form of best practice that will enrich the student learning experience while at the same time enhancing statistical learning performance.

Berenson et al. (2015) and Swanson et al. (1994) describe student views in relation to statistics courses. These indicate that students find statistics courses quite difficult to understand, which causes them anxiety. Furthermore, this seem to have direct and particularly negative implications on students' learning experience, as well as students identifying statistics courses as a hindrance to achieving a good degree classification (Perney & Ravid 1990; Hogg 1991). On degree courses where there is flexibility in when the statistics requirement is taken, it is common for students to put this module off as long as possible (Onwuegbuzie & Wilson 2003).

It becomes quite clear from the literature that teaching statistics to undergraduate students has several special issues to consider, such as heightened anxiety in relation to math, resistance to learning statistics, difficulty identifying the applicability to a chosen degree programme and career, as well as the overall negative learning experience. This in turn has been proven to show negative cognitions. When studying the effectiveness of instructional media it remains important to consider cognitive style as well as learning style. Developers of instructional media must consider these aspects in development, as not every student processes information or learns in the same way (Riding & Sadler-Smith 1997; Mestre 2012).

The introduction of technology into statistical teaching has been shown to have a positive impact on student motivation in terms of learning as well as enjoyment and appreciation for the discipline (Meletiou-Mavrotheris et al. 2007). Haughton & Kelly (2015) created a flipped-hybrid versus a classroom-based

environment and found that students performed better on final statistical exams when exposed to the flipped-hybrid environment. This would indicate that the traditional 'chalk and talk'-style lectures are substandard in teaching and understanding statistical concepts (Larwin & Larwin 2011a). Furthermore, Larwin & Larwin (2011b) found that sections of statistics could be positively enhanced with the addition of computer-assisted instructions in order to benefit student achievement.

Mixed results exist in terms of the effectiveness of video tutorials. DeVaney (2009) introduced the use of video tutorials as an alternative to calculations by hand. These video tutorials served to introduce students to statistical software packages such as SPSS in order to conduct analysis. Results from qualitative data indicated that students responded in a positive manner to this type of instruction. Lloyd & Robertson (2012) focused on the implementation of screencasts, introducing a single video tutorial into a module focusing on using basic strategies to analyse data in SPSS. The results showed enhanced student performance in statistics learning. Furthermore, Allredge et al. (2006) identified that the idea of statistics in action, whereby students are able to watch how a problem is analysed step by step, has a positive effect on students' attitudes towards learning statistics.

Screencasts have been widely used in areas such as computer science and information literacy. For example, university libraries employ screencasts to illustrate the steps of searching through available databases (Betty 2008; Carr & Ly 2009; Gravett & Gill 2010; Williams 2010). Carr & Ly (2009) and Lloyd & Robertson (2012) identify the use of screencasts as being particularly beneficial as an instructional tool in the learning of software applications. Furthermore, the instructional material available as a screencast is perceived as beneficial for students seeking to learn independently

and effectively (Ahmad Zamzuri et al. 2011). Sutton-Brady et al. (2009) have shown a positive perception exists for both students and lecturers in the use of podcasting. The benefits of podcasting have been identified as repeated listening, listening at convenience as well as listening on the go. Similar benefits can be identified with the use of screencasts. These again allow students to revisit set videos at their own pace and convenience, with the element of repeatability at their own leisure.

In keeping with the idea of 'pace, place, mode', the literature seems to indicate some positive results that are worth exploring further in the research methods module in question by means of Lewin's framework, integrating the idea of screencast using Lynda.com.

ACTION PLAN

INITIAL IDEA

Lecturing on the research methods module last year, I identified a common theme from student feedback. Students found certain instructional YouTube videos that I had placed, on an ad hoc basis, to use as a supplement for increasing depth of understanding or merely as a review of the lecture content on Moodle, extremely useful. They emphasised that they would like more of these across all modules. Focusing on a different aspect of the course, again gauged from feedback, students seemed apprehensive and showed some anxiety at the thought of having to complete a statistical analysis task. As a majority rule from experience, students have an adverse view of the need for completing a research methods module which does not seem to them to be of direct clinical relevance. Moreover, it is the association between research methods and maths that causes the most anxiety. Unfortunately, knowledge of selecting and implementing appropriate analytical techniques is one of the required learning outcomes that have been set out for the research methods module. This learning outcome has been aligned to the benchmark statements

derived from the relevant professional bodies, in our case the Chartered Society of Physiotherapists (CSP 2013), the Health Care and Professional Council (HCPC 2013) and the Society of Chiropodists and Podiatrists (SOCAP 2013). Guidance is also taken from the Quality Assurance Agency (QAA 2008) and HEA (2013). Integrating the importance of a non-clinical module and making students understand how this will help in terms of becoming an evidenced-based practitioner seems to be a cumbersome task when relating this to research methods. Evidence-based practice is a big driver currently within medicine and the allied health professions; however, this is not always the first key player that students identify as they embark on their journey across the three years.

RECONNAISSANCE

Speaking to colleagues, with the evidence base readily available that I had collected, we agreed that we would use this term as a trial run, to expose students to the idea of Lynda.com. This would be followed by informal feedback. I therefore decided to create a plan as to how best to integrate this trial run.

PLAN

I decided to rewrite the instructions for one of the analysis tasks incorporated into the students' assessment workbooks. This would give the students the opportunity to interact with the new programme as an assist to completing their coursework, should they wish to use this.

FIRST STEP

Week four was used, within a 12-week term, to introduce the analysis task of the assessment, and consequently the first-time students would be exposed to Lynda.com. Based on a show of hands, 100% of the cohort had never used Lynda.com. I gave a quick demonstration of how to access and log into the site and how to access the 'introduction to SPSS' online content. Students were encouraged to try this in order to help with their assignments. At the end of the introductory session on data analysis, students were asked to try

and log in in their own time and watch the introductory sections found within the 'introduction to SPSS' course.

EVALUATE

During the tutorial sessions, the following week, the students and I discussed the use of Lynda.com and what their perceptions of the website were. Overall, those students that had logged in and used it found the website easy to manoeuvre. One of the popular points was the ability to watch the different sections independently of each other and when needed, as well as the fact that the screencasts were no more than five minutes long. Pausing midway through a video and revisiting at another time was also possible as the programme would recall where you had stopped watching upon logging out; this was also a positive attribute identified by the students. With this positive feedback, I was now able to present to the module leader and start discussing future steps.

AMEND PLAN

From the informal trial feedback (show of hands at this stage), students recommended that this tool is indeed very helpful. They particularly liked the interface and how well the software package was explained. They liked the fact the four-hour long course was broken into minute segments and would be happy to have this incorporated into the research methods module on a week-by-week basis, integrating different statistical examples. The feedback from the students so far has generated some discussion with the module leader as to how best to integrate this for next year's cohort on a weekly basis.

SECOND STEP

Creating additional material for weekly Lynda.com sessions is a task for the summer months in line with delivery in the next academic year. To launch this as an integrated activity it will be worth creating a questionnaire to get more concrete feedback from students, identifying the exact positives and negatives in terms of gaps in learning and delivery. It remains

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important not to forget the collaborative aspect of action research as well as the lack of empirical evidence that has been generated through active enquiry. Recognising that this idea is in its early developmental stages, I hope to be able to continue within Lewin's spirals in order to advance this piece of work to perhaps a grander scale within the department in the first instance. In the future, hopefully there may be opportunities to collaborate with other degree programmes, underpinning the essence of action research.

CONCLUSION

Students are eager to have a multitude of interfaces to learn

from, and these generally align with the times. Studying material 'anytime, anywhere, any pace' has evolved as perhaps my personal educational mantra. This requires developing material in such ways as not to hinder learning but to offer a variety of modes of learning catering to all cognitive and learning styles. This is very much in line with the idea of flexible learning introduced by the HEA, promoting the idea of giving the student a choice of 'when, where and how' to study (HEA 2013). As technology continuously evolves, educators need to strive to integrate new tools into the delivery of modules enabling students to be prepared in the context of today and tomorrow's technological environments. ■

REFERENCES

- Adler, S.M. (2011). 'Teacher epistemology and collective narratives: interrogating teaching and diversity'. *Teaching and Teacher Education*, 27: 609–18.
- Ahmad Zamzuri, M. A., Khairulnauar, S., Mohamad, H. & Salman, F. S. (2011). 'Does screencast teaching software application need narration for effective learning?' *The Turkish Online Journal of Educational Technology*, 10(3): 76–82.
- Allport, G. W. (1948). Foreword. In G. W. Lewin (ed.) *Resolving social conflict*. London: Harper & Row
- Allredge, J. R., Johnson, H. D. & Sanchez, J. J. (2006). 'Does viewing video of statistics in action affect student attitudes?' In A. Rossman & B. Chance (eds.) *Working cooperatively in statistics education: Proceedings of the Seventh International Conference on Teaching Statistics*. Boorbuurt: International Statistical Institute.
- Bargal, D., Gold, M. & Lewin, M. (1992). 'The heritage of Kurt Lewin – Introduction'. *Journal of Social Issues*, 48(2): 3–13.
- Berenson, M. L., Ramnarayanan, R. & Oppenheim, A. (2015). 'Assessing the disconnect between grade expectation and achievement in a business statistics course'. *Journal of Education for Business*, 90(2): 72–9.
- Betty, P. (2008). 'Creation, management, and assessment of library screencasts: The Regis Libraries animated tutorials project'. *Journal of Library Administration*, 48(3/4), 295–315.
- Brown, S. (2013). 'Towards a taxonomy of blended learning'. Paper presented at the Sloan-C Blended Learning Conference, Milwaukee, WI.
- Carr, W. & Kemmis, S. (1986). *Becoming critical: education, knowledge and action research*. Lewes: Falmer Press.
- Carr, A. & Ly, P. (2009). 'More than words: screencasting as a reference tool'. *Services Review*, 37(4): 408–20.
- Chance, B., Ben-Zvi, D., Garfield, J. B. & Medina, E. (2007). 'The role of technology in improving student learning statistics'. *Technology Innovations in Statistics Education*, 1(1). Online: <http://www.escholarship.org/uc/item/8sd2t4rr> [accessed 1 May 2017]
- Chartered Society of Physiotherapists (2013) Online: <https://www.csp.org.uk/documents/hpcstandardsproficiencyforphysiosupdatemay2013pdf> [accessed 1 May 2017]
- Cornelissen, F. & Van den Berg, E. (2013). 'Characteristics of the research supervision of postgraduate teachers action research'. *Educational Studies*, 40: 237–52.
- DeVaney, T. A. (2009). 'Impact of video tutorials in an online educational statistics course'. *Journal of Online Learning and Teaching*, 5(4). Online: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.542.2652&rep=rep1&type=pdf> [accessed 1 May 2017]
- Fernandez, V., Simo, P., & Sallan, J. M. (2009). 'Podcasting: A new technological tool to facilitate good practice in higher education'. *Computers & Education*, 53(2), 385–392. doi: 10.1016/j.compedu.2009.02.014
- French, W. L. & Bell, C. H. (1995). *Organization development*, 5th edn. Englewood Cliffs, NJ: Prentice Hall.
- Garfield, J., & Ben-Zvi, D. (2007). 'How students learn statistics revisited: A current review of research on teaching and learning statistics'. *International statistical review*, 75(3), 372–396. doi: 10.1111/j.1751-5823.2007.00029
- Gega L., Norman I. & Marks I. (2007). 'Computer-aided vs. tutor-delivered teaching of exposure therapy for phobia/panic: randomized controlled trial with pre-registration nursing students'. *International Journal of Nursing Studies*, 44(3): 397–405.
- Gerdsprasert, S., Pruksacheva, T., Panijpan, B. & Ruenwongsa, P. (2010). 'Development of a web-based learning medium on mechanism of labour for nursing students'. *Nurse Education Today*, 30(5): 464–69.
- Gravett, K. & Gill, C. (2010). 'Using online video to promote database searching skills: the creation of a virtual tutorial for health and social care students'. *Journal of Information Literacy*, 4(10): 66–71.
- Haughton, J. & Kelly, A. (2015). 'Student performance in an introductory business statistics course: does delivery mode matter?' *Journal of Education for Business*, 90(1) 31–42.
- Health and Care Professionals Council (2009). Standards of Education and Training. Online: <http://www.hpc-uk.org/assets/documents/1000295EStandardseducationandtraining-fromSeptember2009.pdf> (accessed 1 May 2017)
- Hew, K. F. (2009). 'Use of audio podcast in K-12 and higher education: A review of research topics and methodologies'. *Educational Technology Research and Development*, 57(3), 333–357. Doi: 10.1007/s11423-008-9108-3
- Higher Education Academy (HEA) (2013). 'Flexible learning'. Online: <http://www.heacademy.ac.uk/flexible-learning> [accessed 1 May 2017]
- Hogg, R. V. (1991). 'Statistical education: improvements are badly needed'. *The American Statistician*, 45: 342–3.
- Jang, K., Hwang, S., Park, S., Kim, Y. & Kim, M. (2005). 'Effects of a Web-based teaching method on undergraduate nursing students; learning of electrocardiography'. *Journal of Nursing Education*, 44(1): 35–9.
- Jeffries, P. (2001). 'Computer versus lecture: a comparison of two methods of teaching oral medication administration in a nursing skills laboratory'. *Journal of Nursing Education*, 40(7): 323–9.
- Kaveevivitchai, C., Chuengkriankrai, B., Luechia, Y., Thanooruk, R., Panijpan, B. & Ruenwongsa, P. (2009). 'Enhancing nursing students; skills in vital signs assessment by using multimedia computer-assisted learning with integrated content of anatomy and physiology'. *Nurse Education Today*, 29(1): 65–72.
- Kemmis, S. & McTaggart, R. (1988). *The action research planner*. Victoria, Australia: Deakin University Press.
- Kenny, A. (2002). 'Online learning: enhancing nurse education?' *Journal of Advanced Nursing*, 38(2): 127–35.
- Kim, J., Chang, S., Lee, S., Jun, E. & Kim, Y. (2003). 'An experimental study of students; self-learning of the San-Yin- Jiao pressure procedure using CD-ROM or printed materials'. *Journal of Nursing Education*, 42(8): 371–6.

- Kinsler, K., (2010). 'The utility of educational action research for emancipatory change'. *Action Research*, 8(2), pp.171-189. Doi: 10.1177/1476750309351357.
- Kolb, D. (1984). *Experiential learning – experience as the source of learning and development*. New Jersey: Prentice Hall.
- Lack, K. A. (2013). *Current status of research on online learning in postsecondary education*. New York: Ithaka S+R.
- Larwin, K. H. & Larwin, D. A. (2011a). 'Evaluating the use of random distribution theory to introduce statistical inference concepts to business students'. *Journal of Education for Business*, 86(1): 1–9.
- Larwin, K. H. & Larwin, D. A. (2011b). 'A meta-analysis examining the impact of computer-assisted instruction on postsecondary statistics education: 40 years of research'. *Journal of Research on Technology in Education*, 43(3): 253–78.
- Lewin, K. (1947). *Group decisions and social change*. In T. M. Newcomb & E. L. Hartley (eds.) *Readings in social psychology*. New York: Henry Holt.
- Lewin, K. (1952). *Field theory in social science: selected theoretical papers*. London: Tavistock.
- Lloyd, S. A. & Robertson, C. L. (2012). 'Screencast tutorials enhance student learning of statistics'. *Teaching of Psychology*, 39(1): 67–71.
- McMullan, M., Jones, R. & Lea, S. (2011). 'The effect of an interactive e-drug calculations package on nursing students and drug calculation ability and self-efficacy'. *International Journal of Medical Informatics*, 80(6): 421–30.
- McTaggart, R. (1996). 'Issues for participatory action researchers', in O. Zuber-Skerritt (ed.) *New directions in action research*, London: Falmer Press.
- Meletiou-Mavrotheris, M., Lee, C. & Fouladi, R. T. (2007). 'Introductory statistics, college student attitudes and knowledge – a qualitative analysis of the impact of technology-based instruction'. *International Journal of Mathematical Education in Science and Technology*, 38(1): 65–83.
- Mestre, L. S. (2012). 'Student preference for tutorial design: a usability study'. *Reference Services Review*, 40(2): 258–76. doi: 10.1108/00907321211228318.
- Millichap, N. & Vogt, K. (2012). 'Building blocks for college completion: blended learning'. *Educause Review*, 1-20.
- Onwuegbuzie, A. J. & Wilson, V. A. (2003). 'Statistics anxiety: nature, aetiology antecedents, effects, and treatments – a comprehensive review of the literature'. *Teaching in Higher Education*, 8(2): 195–209.
- Perney, J. & Ravid, R. (1990). 'The relationship between attitudes towards statistics, math self-concept, test anxiety and graduate students' achievement in an introductory statistics course'. Paper presented at the American Educational Research Association.
- Quality Assurance Agency (QAA) (2008). *The framework for higher education qualifications in England, Wales and Northern Ireland*, 2nd edn. Online: <http://www.qaa.ac.uk/academicinfrastructure/FHEA/EWNI08/default.asp> [accessed 1 May 2017]
- Reime, M., Harris, A., Aksnes, J. & Mikkelsen, J. (2008). 'The most successful method in teaching nursing students infection control – E-learning or lecture?' *Nurse Education Today*, 28(7): 798–806.
- Riding, R. J. & Sadler-Smith, E. (1997). 'Cognitive style and learning strategies: some implications for training design'. *International Journal of Training and Development*, 1(3): 199–208. doi:10.1111/1468-2419.00020.
- Rudduck, J., (1988). *The ownership of change as a basis for teachers' professional learning*. Teachers' professional learning, pp.146-169.
- Smith, M. K. (2001). 'Kurt Lewin, groups, experiential learning and action research, the encyclopaedia of informal education'. Online: <http://www.infed.org/thinkers/et-lewin.htm> [accessed 1 May 2017]
- Society of Chiropractors and Podiatrists (2013). Online: http://www.members.feetforlife.org/doclibrary/podnow/8958_PN99013.pdf [accessed 1 May 2017]
- Stringer, E. T. (2007). *Action research: a handbook for practitioners*. Newbury Park CA: Sage. 3rd edn.
- Sutton-Brady, C., Scott, K. M., Taylor, L., Carabetta, G., & Clark, S. (2009). The value of using short-format podcasts to enhance learning and teaching. *ALT-J*, 17(3): 219-232. DOI: 10.1080/09687760903247609
- Swanson, J. C., Meinert, D. B. & Swanson, N. E. (1994). 'Business communications: a highly valued core course in business administration'. *Journal of Education for Business*, 69(4): 235–9.
- Williams, S. (2010). 'New tools for online information literacy'. *The Reference Librarian*, 51(2): 148–62.
- Wu, D. (2015). *Online learning in postsecondary education: a review of the empirical literature (2013–2014)*. New York: Ithaka S+R.
- Zambo, D. & Isai, S. (2012). 'Lessons learned by a faculty member working in an education doctorate program with students performing action research'. *Educational Action Research*, 20: 473–9. doi:10.1080/09650792.2012.697668.
- Zieffler, A., Garfield, J., Alt, S., Dupuis, D., Holleque, K., & Chang, B. (2008). 'What does research suggest about the teaching and learning of introductory statistics at the college level? A review of the literature'. *Journal of Statistics Education*, 16(2). Doi: 10.1080/10691898.2008.11889566.