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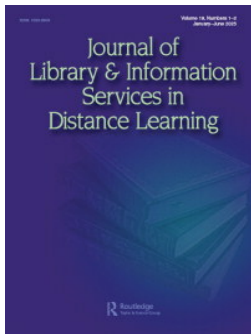
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In Defense of Paper! A Case Study of Paper Based Active Learning Methods Developed for Distance Learning Engagement

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ABSTRACT

Educators, including library professionals are fortunate to have access to multiple educational Apps, virtual learning environments, and smartphones. However, during numerous Information Literacy sessions at Manchester Metropolitan University, the authors have continued to witness the value of paper-based activities. In this case study, we will discuss our experience of using paper-based active learning methods within library sessions for students in distance learning programmes. We aim to reflect on the efficacy of this approach and justify it with reference to the wider science literature. We also want to emphasize the importance of distance learning as an incubator for innovative practice.

KEYWORDS

Active learning;
information literacy;
academic librarianship;
teaching; instruction;
playful learning

Background

Within this article, active learning is defined as learner-centered with students developing knowledge by doing and experiencing in class whilst the presenter acts as a facilitator (Misseyanni et al., 2018). The bulk of the literature on active learning focuses on the use of technology as a means of delivering less passive learning. Technology-based active learning certainly helps to deliver for distance learners (who are working away from campus) and can also prove time-efficient and effective in the classroom, but, in the digital era, we should consider the potential for Information Technology (IT) overload for students. The authors conducted an informal interview with a sport science tutor at Manchester Metropolitan University and this lecturer stated that his students receive a tremendous amount of instruction and communication *via* digital channels and so a periodic shift to paper-based learning offers an alternative, novel, approach (C. Mackintosh, personal communication, May 20, 2024). Masrek and Baharuddin (2023) noted

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the pressure on distance learning students when balancing engagement with webinars, other live virtual sessions and asynchronous online content.

As librarians, we support three distance learning programmes: BSc (Hons) Bioscience, BSc (Hons) Chemical Science, and BSc (Hons) Sport and Exercise Science, and we have employed a paper-based active learning approach when delivering to distance learners during their very limited visits to, and time on, the University's campus. The first two programmes recruit directly from the Chemical and Bioscience industry. The Sport and Exercise programme generally has older students and often recruits elite sports people coming to the end of their playing career. For these students, almost all of their course is delivered remotely meaning a high reliance on information technology. We are fortunate that distance learners attend several sessions at the University campus. This happens once or twice a year and is internally described as the residential programme. Library sessions during the residential cover topics, such as referencing, academic databases awareness, and evaluation of scientific resources.

We are lucky to be asked to participate in these residentials as they allow for some social inclusion and a break from IT-based learning for students in distance learning programmes at Manchester Metropolitan University and the paper-based activities are designed to support this break. It allows the students to collaborate and hopefully bond, given that such distance learning students will either not know each other or have possibly had minimal digital contact. Such cohorts will have also undertaken a considerable amount of independent study, whilst concurrently working in the private industry. We have also used paper-based activities with campus-based student cohorts, but the focus of this article will be the development of resources with distance learners front and center in the design process.

In this article, we will share and reflect upon our experience developing and delivering paper-based activities as part of embedded information literacy instruction within academic modules and courses and their use within distance learning residential programmes. Our analysis focuses on distance learning programmes which include an on-campus instruction aspect, but we will highlight how this experimentation is applicable within additional learning contexts. We will identify challenges but strongly advocate for a sense of adventure and experimentation within a rediscovery of paper-based activity in a digital world. As noted in a previous article, distance learning is the ideal testing and development ground for information literacy and other approaches in librarianship (Wheeler & Kyprianou-Chavda, 2021).

Why use active learning. A review

The potential benefits of active learning are well-detailed in the academic literature concerning undergraduate teaching. For example,

Alhawiti (2023) found that active learning helps to foster strong teacher-student relationships and is a more effective approach than conventional didactic (or chalk and talk) style teaching. In regards to the delivery of undergraduate education, Bovill (2020) considers active learning to be one of the seven key elements constituting good practice. It is arguable that active learning helps a learning space to become conducive to classroom interaction between student and tutor. In a paper focused on chemistry students, Nardo et al. (2022) outline that active learning appears to improve student equity and inclusivity. Following a study of university students, Hendrickson (2021) concluded that simple active learning techniques, such as classroom debate can enhance student interest in course content and build confidence in their ability to attain educational goals. Dogani (2023) details that an active learning approach allows students to engage in problem solving and to discuss topics as a team, as well as examining, synthesizing, and evaluating information during learning activities.

In general, active learning is an essential element in helping to generate learning situations conducive to in-class interaction between students and tutors. It helps aid students' critical thinking, motivation, performance, and the opportunity for peer learning and communication (Ardhaoui, 2023). Following research into physical active learning techniques, Rupp et al. (2022) concluded that, "findings suggest that physical movement integrated into university teaching should have a positive effect on learning performance" (p. 7).

Without hands-on activities requiring student effort, a solely chalk and talk approach creates a passive learning experience (Fisher & Frey, 2021). Active, physical learning wholly involves the student and is conducive to educational growth (Jefferson & Anderson, 2021). Students engaged in active learning are more likely to relate to the teaching material and will be developing their critical thinking skills (Dogani, 2023).

Why we use active learning, and developed specific paper-based activities for distance learners

In this section, we will introduce the activities that we created for Information Literacy (IL) sessions in distance learning residentials. We will try to reflect on them through the lens of the wider literature concerning active learning. At this point, we must note that these activities have been developed over three years after the return to face-to-face teaching following the Covid-19 pandemic. These methods have been developed without reference to the literature; indeed, they were developed by experimentation, accompanied with a sense of pragmatism and fun.

We aimed to create activities that would be memorable and create a sense of occasion for students taking part in their respective residential programmes.

Various methods can be employed as part of an active learning approach to classroom teaching. For example, question and answer, brainstorming exercises, classroom discussion and debate, paper-based quizzes, etc. (Misseyni et al., 2018). Aburahma (2015) considers the following elements to be part of a five-step cycle to make pharmacy lectures less of a passive learning experience for students; ask an introductory question, use think-pair-share, spend time on individual silent written reflection, deliver a self-assessed task, and finally, allow time for student questions. The first four elements are all paper-based activities.

The paper-based activities developed for distance learning residentials

Here are details of the various active learning activities the authors have employed in their information literacy and referencing sessions. We have included personal photographs of the resources and our explanations of how we use these resources for clarity.

Royal Society of Chemistry card sort activity (Piper Alpha)

This activity is designed to support a Royal Society of Chemistry (RSC) referencing session and is delivered to degree apprentices working within the chemical industry. As an activity, it aims to support students completing an assignment on the 1988 Piper Alpha oil platform disaster. Students have a brief introduction to the referencing style and associated key documents, such as the UK Health and Safety Executive's Cullen Report from 1990, that they are expected to refer to within their assessment. The students are put into groups of six. Each of those groups are subsequently named after a specific cause of the oil platform disaster (such as Permit to work, Gas from Claymore and Tartan rigs) contextualizing the activity within the wider summative assessment. The groups then complete a card sort activity to create a properly formatted set of RSC references. This activity is completed against the clock and there are prizes for the fastest team (Figure 1).

The above picture shows the completed card sort. The activity encourages tactile engagement with referencing and allows the session leader to assess groups quickly and effectively. The fact that this activity is designed around both a summative assessment objective and a workplace incident is intended to appeal to industry professionals studying for degree level qualifications.

The above picture shows the unsorted paper for the scavenger hunt activity. This activity is very useful for highlighting key texts in an academic area, prompting students to engage with referencing rubrics, and encouraging attention to detail. As an activity, it is designed to be memorable and a little silly to give a sense of occasion to the sessions it is used within.

Referencing A3 paper activities

This activity is designed around oversized A3 sheets of paper which are hung on the wall within a teaching room. A piece of writing including citations and a reference list containing multiple mistakes is printed upon these sheets. Within the activity, students go around the teaching room, identify the referencing errors, highlight them on the sheets, and then provide feedback to the seminar. This activity naturally lends itself to group working and groups tend to be spontaneously self-assembling. Because we want students to move around the room, we provide multiple A3 sheets (please see below for indicative screenshots used within an RSC referencing session). This activity can be used for any referencing style.

1) References: (Task 1)

Polymer concrete often has better tensile strength, compressive strength, and flexural strength than traditional concrete.¹ It also cures faster, making it useful when a rapid turnaround is necessary.² However, it is associated with high cost.³

1. P. W. Atkins and J. de Paula, *Elements of Physical Chemistry*, Oxford University Press, Oxford, 7th edn., 2017.

2. P. W. Atkins and J. de Paula, *Elements of Physical Chemistry*, Oxford University Press, Oxford, 7th edn., 2017.

3. P. W. Atkins *et al.*, *Atkins' Physical chemistry*, Oxford University Press, Oxford, 11th ed., 2018, p.87.

Figure 3. Referencing A3 paper activity (example 1). Picture taken by Alex Wheeler and David Matthews (Manchester, UK. Manchester Metropolitan University, 2025). No permission required.

The issue with Task 1 A3 sheet (Figure 3) is the badly formatted reference list. Apart from the incorrect line spacing issue, there should not be multiple entries of the same textbook within a properly formatted RSC list.

2) References (Task 2)

The growth of SFC as a separation technique began with the release of reliable SFC systems and the manufacture of a wide variety of stationary phases.⁴ The increased reliability of the instrumentation was partially due to the introduction of a robust back pressure regulator, which means greater reproducibility. SFC technology can rapidly screen multiple stationary phases with a variety of mobile phase compositions.⁵ This is essential in identifying desirable chromatographic conditions for the separation of achiral impurities. The differences in selectivity come about from the interaction of the molecule with the column chemistry, including the ligand and the bonded phase. As well as varying the stationary phase, the mobile phase can significantly alter the selectivity. The use of additives is also commonplace, and the nature and concentration of the additive can have a large impact.⁶

4, E. Lesellier and C. West, *J. Chromatogr. A*, 2015, **1382**, 2–46.

5, W. Majewski, E. Valery and O. Ludemann-Hombourger, *J. Liq. Chromatogr. Relat. Technol.*, 2005, **28**, 1233–1252.

6, Burrows, A, *Chemistry³: introducing inorganic, organic and physical chemistry*, Oxford University Press, Oxford, 3rd edn., 2017. 56-98

Figure 4. Referencing A3 paper activity (example 2). Picture taken by Alex Wheeler and David Matthews (Manchester, UK. Manchester Metropolitan University, 2025). No permission required.

The issue with the Task 2 A3 (Figure 4) sheet is the sloppy formatting of the entry for the Chemistry³ textbook. The inclusion of page numbers for a textbook entry is wrong. Students also correctly identify that the resource list should start at 1 as opposed to 4.

3. References (Task 3)

The growth of SFC as a separation technique began with the release of reliable SFC systems and the manufacture of a wide variety of stationary phases.⁴ The increased reliability of the instrumentation was partially due to the introduction of a robust back pressure regulator, which means greater reproducibility. SFC technology can rapidly screen multiple stationary phases with a variety of mobile phase compositions.⁵ This is essential in identifying desirable chromatographic conditions for the separation of achiral impurities. The differences in selectivity come about from the interaction of the molecule with the column chemistry, including the ligand and the bonded phase. As well as varying the stationary phase, the mobile phase can significantly alter the selectivity. The use of additives is also commonplace, and the nature and concentration of the additive can have a large impact.⁶⁻⁷

Reference list

4. The Public Inquiry into the Piper Alpha Disaster, (accessed October 2021).
5. D. Jacobson-Kram and T. McGovern, *Adv. Drug Deliv. Rev.*, 2007, 59, 38.
6. D. Jacobson-Kram and T. McGovern, *Adv. Drug Deliv. Rev.*, 2007, 59, 42.
7. P. W. Atkins and J. de Paula, *Elements of Physical Chemistry*, Oxford University Press, Oxford, 7th edn., 2017.

Figure 5. Referencing A3 paper activity (example 3). Picture taken by Alex Wheeler and David Matthews (Manchester, UK. Manchester Metropolitan University, 2025). No permission required.

The issue with the Task 3 A3 sheet (Figure 5) is the sloppy formatting of the Jacobson-Kram & McGovern article, with the volume number not being in bold. Another error is the multiple entries for this article. Additionally, the page numbering is incorrect as an RSC reference should include a page range rather than references to specific numbers. The entry

for the Piper Alpha enquiry does not include a URL. Students should also correctly identify that the resource list should start at 1.

The above figures (Figures 3–5 for Tasks 1, 2, and 3) are indicative examples of the A3 sheets of paper which are hung on the wall within a teaching room. The activity allows students to engage with the referencing rubric.

In teaching sessions utilizing paper based active learning, we also provide students with A3 sheets that each have a specific referencing element printed on them. We then ask for volunteers to stand at the front holding the elements of a reference list entry and the students in the class collectively work together to place the people and the reference elements in the right order according to the style being followed.

Below is a picture of the A3 sheets featuring referencing elements. This example uses RSC referencing. It is a way of encouraging students to engage with referencing rubric in a lighthearted manner. Lamination of sheets also ensures they can be re-used. It is an excellent way to highlight key texts to students in first year undergraduate modules (Figure 6).

TRAAP bins and database bins

A key information literacy skill is evaluating sources and whether they are appropriate for academic work. As such, evaluation frameworks like the Currency, Relevance, Authority, Accuracy, and Purpose (CRAAP) and Timeliness, Relevance, Authority, Accuracy, and Purpose (TRAAP) tests are common frames of reference within information literacy-based instruction. Such tests promote students questioning of the currency, reliability, authority, accuracy, and purpose of information sources. This activity is based around students looking at several sources and making a judgment as to why they may or may not be appropriate academic sources. The example resources include an article from a predatory open access journal, an advertisement for fitness supplements, a Wikipedia entry, and an article from a tabloid newspaper. Students are given details of these sources on separate pieces of paper and are then encouraged to make notes on them explaining why they are not appropriate academic resources. Once they have done this, students are encouraged to scrunch up the various pieces of paper and throw them into one of five bins which are labeled in accordance with the TRAAP test. This activity is designed to play to the strengths of the sport students who often feel very happy with kinesthetic activities, and it encourages wider competition.

We also adapt this activity to introduce students to literature searching in science. We bring along three paper bins labeled: Process, Chemical, and Equipment/Technique. We also bring along sheets of paper with examples of chemicals, processes, and equipment (such as Soda Ash, Haber

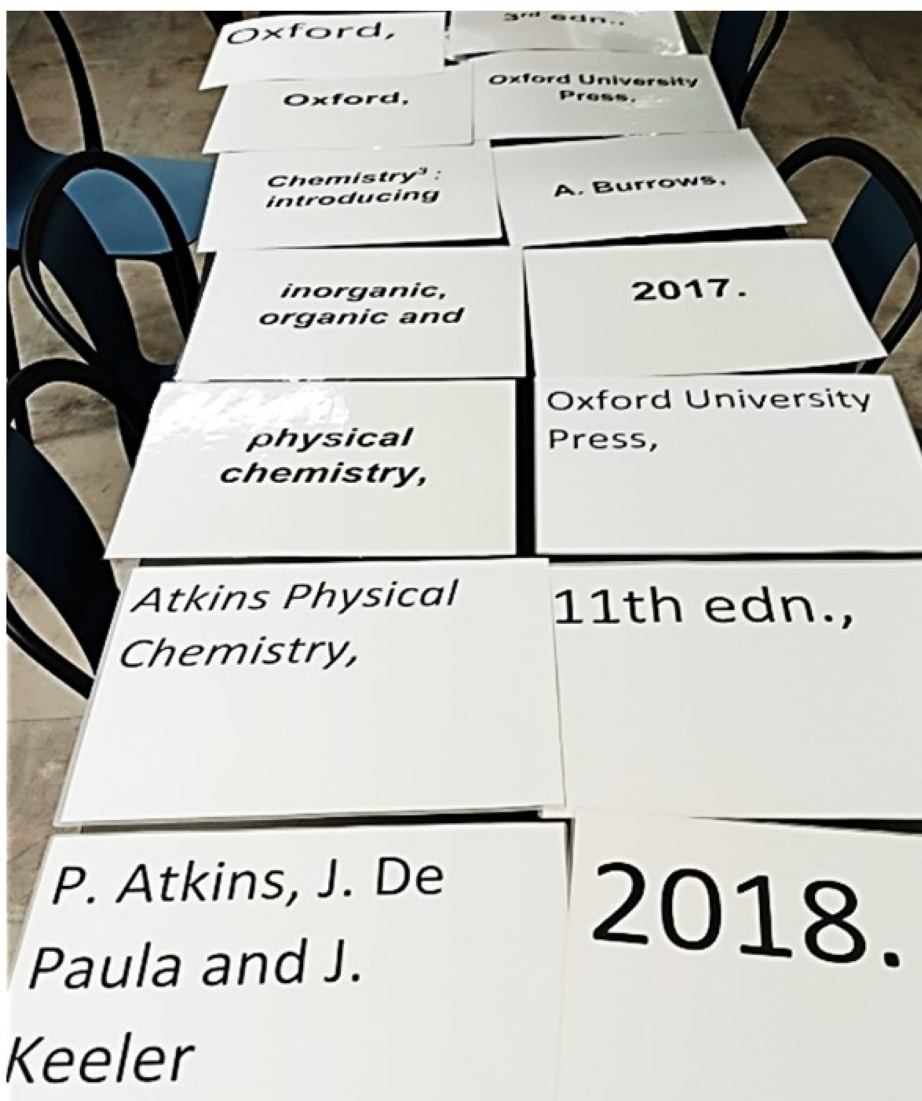


Figure 6. Referencing A3 paper activity (example 4). Picture taken by Alex Wheeler and David Matthews (Manchester, UK. Manchester Metropolitan University, 2025). No permission required.

Process, Cat Cracker, etc.). Once they have done this, students are encouraged to scrunch up the paper and throw them into the correct bin. This activity was designed to be memorable, a little silly, and introduce students to literature searching by getting them to think of the bins as databases and the sheets of paper as keywords.

Microsoft forms: digital and paper quizzes providing an alternative

As part of our IL teaching programme to STEM students, the authors recognized that it is important to try and offer session attendees a choice

of paper-based or digital activities. To this end, we created two versions of an Microsoft (MS) Forms quiz focused on citing and referencing skills for full time master's degree students in engineering. Whilst the questions and answers were displayed digitally at the end of the activity, students could choose between completing the questions on a paper quiz sheet or digitally on their mobile devices. Interestingly, there was roughly a 50–50 split between those students who elected to complete the quiz on paper and those who used their mobile devices. Anecdotally, from the presenter's point of view, those students using the paper quiz form debated the answers more readily than those using their mobile devices. It must be noted though that the use of mobile devices does not preclude group discussion. Some students elected to take their completed paper forms with them although the form and answers could be shared digitally with the group too. Subtle differences were required in the wording of some of the questions in the paper and digital versions of the quiz (see image below) (Figure 7).

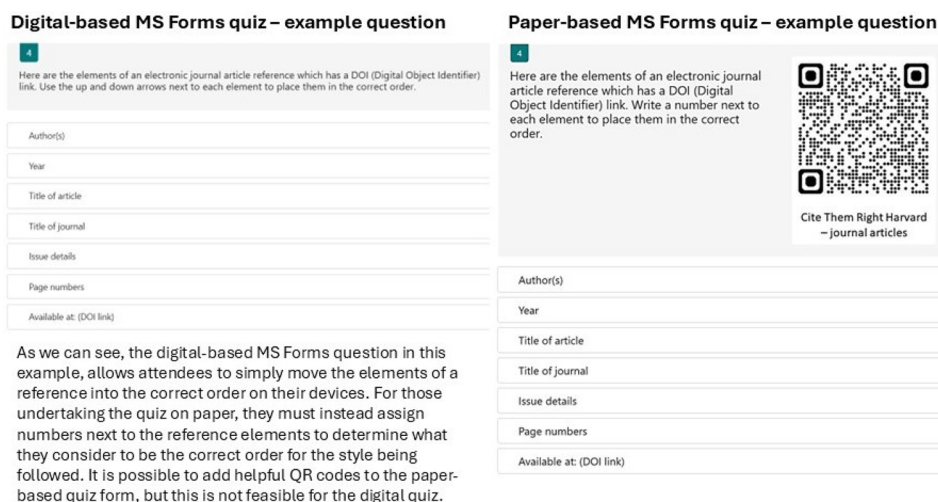


Figure 7. Digital and paper-based MS forms quizzes. Screenshot taken by Alex Wheeler and David Matthews (Manchester, UK. Manchester Metropolitan University, 2025). No permission required.

A literature informed reflection on the effectiveness of these approaches

As these activities have been developed over time, it is important to reflect on the extent to which such an approach is supported by the wider Library and Information Science (LIS) literature. In effect, we will attempt to retroactively justify the use of paper-based active learning methods. It has certainly been beneficial to reflect upon certain activities through the indicative lens of the published literature; it has allowed us to reverse

engineer the process and have a greater understanding of the impact of activities. Fink (2013) details a similar activity to the authors, with student groups collaborating on a problem, writing recommendations on an A3 sheet of paper, posting these around the classroom, and then all groups move around the teaching space to make comments on each set of recommendations. Colored sticky notes are then used to vote for the post popular recommendation and any recommendations that require further clarification.

It is arguable that the educational benefits of the “act of moving,” “embodied learning,” or “embodied cognition” in relation to university students has been less covered in academic literature. Sani et al. (2021) concluded that embodied learning can incorporate either a simple media approach or a technology-based one. They added that a combination of cognitive and motor-sensory skills aids student understanding and helps to develop knowledge (Sani et al., 2021). Subconsciously, whilst preparing these activities, we were adhering to these principles. Certainly, the principle behind the TRAAP bins/database bins activity is to encourage physical movement. This activity also seems to engender a sense of competitiveness. We have found that this resonates particularly with the elite sports students. By encouraging competition and judgment, we are aiming for the self-actualization stage within Bloom’s Taxonomy. Hendrickson (2021) stresses the importance of using multiple active learning activities that complement each other and provide a richer educational experience for students compared to undertaking only one such activity. As such, allowing students to analyze sources, critique them, and throw them into the relevant TRAAP bin fits into the paradigm.

In an increasingly digital first world, the use of paper-based activities helps to introduce variety and can feel quite innovative. Potentially, there is also an inclusivity angle given different learning styles. For distance learners visiting campus for residential sessions, using paper-based quizzes and other paper-based active learning exercises can feel like a positive change to digital based online learning, which will understandably constitute the bulk of the distance learners experience. A key reason for using these techniques in an information literacy context is to engage learners with potentially dry topics, such as referencing. Although citing and referencing information sources is a key academic skill, students are often alienated by didactic teaching which, in a referencing session for example, may overly focus on very specific detail, such as the position of a comma in a reference list entry or when to use a semi-colon, italics, round brackets, etc. Williams et al. (2014) noted that receiving such direct instruction could generate a very superficial understanding of referencing as opposed to a more rigorous working knowledge. By using gamification, criticism, and competition within focused paper-based activities, we aim to engage

students and give them the skills to create accurate references and identify relevant, credible academic sources. In this way, we try to make the activities interesting, contributing to an experiential learning context for the students whilst encouraging deeper learning.

When comparing the use of paper-based *versus* gamified technology in a flipped classroom setting, Pratiwi et al. (2024) found that, in general, a paper-based method was more successful in helping to teach vocabulary for students where English is not their first language. This paper-based approach also proved effective for learners of differing educational proficiency, both high and low. It is also arguable that, given different learning styles and preferences, some students may not consider technology-based learning as being their preferred educational environment. In terms of the authors' active learning activities, the focus on identifying errors in a reference list entry within these paper-based activities is 2-fold and bears some resemblance to the conclusions of Pratiwi et al. (2024). First, this approach taps into student enjoyment of correcting a teacher, instructor, or academic's mistake. We planned the session around the assumption that we can encourage engagement with referencing rubrics if there is a chance to catch someone who should know better. Secondly, this approach encourages the attention to detail which is so essential to academic research and referencing. In our experience, these activities provide an ideal opportunity for learners to develop their knowledge and their confidence in key skills, such as referencing, which reflects the experience of Nardo et al. (2022).

All the activities detailed in the previous section fundamentally act as formative assessment methods. Within the literature, employing paper-based assessment as formative assessment is a well-covered topic. Thomas (2019) states that paper-based assessments are a valuable device for formative assessment and found that some students prefer paper-based quizzes compared to the use of electronic audience response systems. Sevim-Cirak and Islim's study (2023) found that students using paper-based quizzes performed better in exams than students who had taken quizzes online *via* the Kahoot! audience response system. In an informal interview between the authors and an engineering tutor at Manchester Metropolitan University, the tutor stressed the importance of active learning in making sure that students understand the content being imparted (H.A. Insley, personal communication, April 29, 2024). Whilst the tutor acknowledged the popularity of systems like Kahoot! amongst students, he stated that paper-based group active learning exercises increase the students' level of understanding and leads to more robust learning since the students must actively "do something" and engage in peer discussion.

In a paper-based group active learning environment, underlying knowledge gets much more exposed to their memory (H.A. Insley, personal

communication, April 29, 2024). By comparison, online quiz tools like Kahoot! are more of a solo pursuit and there is arguably less activity involved on the student's part. Sharpton et al. (2019) found that pharmacy students studying spirometry considered their learning less difficult when completing paper-based active learning only. Emerson and MacKay (2011) also found that students' learning outcomes for paper-based lessons were considerably better than those who learned online. In her teaching project, Schwarm (2020) replaced lectures with paper exercises which incorporated group discussion and an oral presentation. Conclusions from this project were that paper-based exercises may be especially fitting for small groups, they represent a student-focused approach to learning, improved students' perception, and proved popular in terms of student satisfaction (Schwarm, 2020). Indeed, our experience reflects these points. The importance of a clear group setting is essential in the Piper Alpha card sort activity. We also designed the A3 referencing activity with the intention that students would form self-selecting groups to complete the activities.

In their study of university students' academic progress when comparing the effectiveness of weekly quiz application forms (both online and paper-based), Gurkan and Cigdem (2022) found that online quizzes improved students' knowledge more than paper-based quizzing. This may suggest that a blended approach of both technological and paper-based action learning activities may be desirable. It is certainly fair to say that a shift to technology-based online learning from traditional paper-based methods has been gathering pace for quite some time (Emerson & MacKay, 2011). Of course, at the time Emerson and MacKay (2011) wrote their article, the smartphone was in its relative infancy and the years since have seen a dramatic increase in the amount of screen time and the frequent activity of being online. Also, our own specific context is relevant as many of our activities were developed for distance learning students. Distance learning means that the novelty of using technology-based resources is perhaps not as obvious after the 14 years of their use within a classroom setting since Emerson and MacKay's article (2011). It seems clear that the educational benefits of the act of moving, embodied learning, or embodied cognition, in relation to university students has been less covered in the literature. Rupp et al. (2022) found that physical movement within university teaching can have a positive effect on learning performance, which is reflected by the positive informal feedback we have received for the activities we have employed.

With reference to the Piper Alpha card sort referencing activity and the referencing scavenger hunt, we have found that students enjoy the tactile nature of the activity and enjoy the competitive element that we designed into these exercises. Our informal, instinct-based observations are reflected in the wider literature. Using paper response cards allows

the presenters to break up the traditionally passive, one-dimensional nature of orthodox classroom sessions encouraging interactivity and student involvement. Such an approach helps students sustain their concentration (Ruisoto & Juanes, 2019). From a pragmatic pedagogical perspective, all these activities are methods of assessing student learning and supporting their work toward summative assessments. Additionally, Scavenger hunts are acknowledged as, “an active learning strategy that can be employed at the beginning of a course or module and set the tone for an active, engaged classroom environment” (Jones et al., 2017, p. 94). Scavenger hunts can also help develop team building with groups working together to achieve their shared goal (Barkley et al., 2014). These considerations are central to working with students and introducing them to key academic skills. Taking it one step further, we argue that highlighting key skills in an active manner highlights the library as a key academic resource and hopefully makes them feel more confident in their assessments and approaching librarians for further assistance.

A final point, which needs to be carefully acknowledged, is that paper-based approaches are a novelty within the current classroom setting. In a digital first environment, the novelty or freshness of a paper-based approach is key in engaging students and pushing their learning within a stand-alone session. Clearly, more research is needed into the topic of IT fatigue.

Challenges of using paper based active learning

There are some challenges to consider with the adoption of less passive learning techniques. For example, Robertson (2018) noted that there may be student resistance to active learning which means that the presenter needs to consider the support required to shift students from a passive to active learning environment. Ultimately, a blended approach may be the most desirable method. In their comparison of the use of established paper-based methods *versus* the adoption of gamified technology in a flipped classroom environment, Pratiwi et al. (2024) found that the paper-based approach could potentially cause student boredom. Some students could view paper-based activities as being rather anachronistic and it is important that the presenter is able to enthuse and energize the students in the classroom so that they engage with the paper-based activities.

As Proud (2022) acknowledges, facilitating discussion can be problematic in classes where students are seated in fixed rows. This is one reason for encouraging movement within the learning environment, using wall-mounted poster activities, for example. Of course, health and safety, as well as student mobility, does need to be considered if adopting this

approach. Alqasa and Afaneh (2022) also noted the importance of the classroom environment to a successful active learning space. This, in turn, has a bearing on student satisfaction. How was it for students to work collaboratively in the space? Is there scope for the flexible use of seats and desks? The need for the design of such flexible spaces to facilitate student collaboration is acknowledged by Sengupta et al. (2020).

It is important that active learning activities are designed with inclusivity in mind so that students are equitably supported (Nardo et al., 2022). Tutors and librarians need to have a good knowledge of active learning principles and techniques so that sessions are designed to be effective, encouraging critical thinking, problem solving, and peer-to-peer collaboration (Dogani, 2023). Without this knowledge, sessions may not be as engaging, and activities may not generate an effective learning experience. In a paper-based active learning environment, it is essential that the learning outcomes of the session are considered and that activity timings are strictly observed in line with session time (Aburahma, 2015). In relation to the effective delivery of active learning practices, Børte et al. (2023) recommend that teaching is considered as a collective responsibility across an institution and that teaching practices should be developed continuously amongst staff with opportunities for experience sharing and the provision of ample feedback to teaching colleagues.

When adopting a paper-based approach to active learning, a certain amount of time is required for the printing, cutting up, and potential laminating of materials required for the physical exercises. Such sessions often require two presenters due to the time needed to place posters on walls and hand out quizzes and other exercise materials. There is also an argument in having two presenters to help keep the learning space energized. We do realize that doubling up in this way cannot always be accommodated. Presenter technique is key to ensure that a session is vibrant and engaging as well as in helping to invigorate a room. This, of course, requires the presenter to get into the right headspace for such energetic delivery. Many teaching spaces pose issues in terms of layout of the space and accessibility can be an issue as well. There is also the challenge of whether to use a more physical approach to active learning or whether to use technology. We, of course, use student response systems in digital format too, like Kahoot and Vevox, etc., and the research suggests that both paper-based quizzes and activities as well as using digital response systems can aid learning. Though it does feel that the use of paper activities is quite novel in a digital first world and mixes the delivery up somewhat. It also adds some scope for more physical movement in the learning space.

Finally, we acknowledge that teaching style and approach is a very personal consideration; some information professionals will not feel comfortable using a paper-based active learning approach. We are presenting

our considered reflections because of our enjoyment of employing these methods and our success at deploying them at set times during academic courses. We advocate that LIS professionals involved with teaching consider how to integrate paper-based active learning into their practice.

Impact of using paper based active learning

In terms of the impact of paper-based active learning sessions for distance learning students at Manchester Metropolitan University, positive tutor feedback has been received. A senior lecturer in chemistry wrote, “I felt compelled to pass on our team’s praise this week because [librarian] delivered a referencing session to our degree apprentice students on campus yesterday, and his work was truly outstanding. The enthusiasm and energy he had in the room was infectious. Students were completely engaged in the session—they found [named librarian] very informative and entertaining in equal measure. I was especially impressed by the way he designed the activities for the students” (E. Randviir, personal communication, November 04, 2023). Similarly positive feedback was received from tutors within Chemical Science who, following a similar session from the teaching team, noted far fewer referencing mistakes in an associated report submission. In these sessions, the authors have witnessed considerable student engagement and classroom energy whilst working in groups. The session content has really resonated with students despite some of it being rather detailed in nature, e.g. referencing guidance, potentially being rather dry to impart. Clearly, it would be useful to undertake some further research work into the impact of such activities within a further study and article or conference paper.

Conclusion

In conclusion, we advocate for wider use of paper-based activities. However, we acknowledge the challenges and the need to promote these activities with academic colleagues. We also understand the need to ask tutors for more IL session time if they wish us to incorporate paper-based active learning in class. We also acknowledge that this investigation is a work in progress, and we are reflecting on the story so far. Going forward, we need to consider gleaning feedback *via* Google Forms and perhaps start with the literature when designing activities.

Following the adoption of paper-based active learning, Schwarm (2020) concluded that these exercises promoted student engagement with the active learning process and commented that, “some students stated that the paper exercises were a good opportunity to practice the reading, understanding and presenting of scientific content in English and that the more we practiced it, the easier it got” (p. 26). Despite our considered

defense of the use of paper-based active learning in a digital era classroom, we cannot ignore the rise of Generative AI tools and appreciate that universities must embrace such technology in an appropriate and ethical manner that hopefully complements study. We should acknowledge that AI has the capability to produce online quizzes and assessments that can be adapted to suit students' levels of performance, and this could potentially reduce the need for paper-based testing. Ultimately, we suggest that a blended approach to active learning techniques should be explored, where paper-based active learning techniques are part of the teaching offer alongside technological approaches. This should facilitate student engagement and ownership of their learning and provide a varied classroom experience and environment conducive to deep, retentive learning.

Clearly, additional research is needed in this area, preferably with input from active learning teaching sessions conducted in multiple universities and with traditional on-campus cohorts of students so that we are not limiting our analysis to distance learning courses with on-campus residential aspects. Furthermore, rather than a case study, perhaps a survey of students within an ethically approved research context is required. We also advocate for the freedom for librarians to develop such active learning activities and we wish for them to have the confidence to give such approaches a try. Finally, this experience has emphasized that distance learning cohorts are the ideal setting to develop and test new ideas and innovate.

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Conflict of interest

The authors have no conflicts of interest to report.

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