TEACHING INFORMATION SYSTEMS STUDENTS TO WRITE A SYSTEMATIC LITERATURE REVIEW BEFORE AND DURING COVID-19

Machdel Matthee  
*Department of Informatics, University of Pretoria*, machdel.matthee@up.ac.za

Lizette Weilbach  
*Department of Informatics, University of Pretoria*

Carina de Villiers  
*Department of Informatics, University of Pretoria*

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Machdel Matthee
Department of Informatics
University of Pretoria
machdel.matthee@up.ac.za

Lizette Weilbach
Department of Informatics
University of Pretoria

Carina de Villiers
Department of Informatics
University of Pretoria

Abstract
Fourth year Information Systems (IS) students are expected to write a research paper on a selected IS topic. At the University of Pretoria in South Africa, a number of challenges were faced towards reaching this goal: many students have poor research and academic writing skills; the supervision load grows significantly as student numbers increase annually; and students’ final research papers are rarely publishable. Some of these problems were solved by changing the module’s objective to writing a systematic literature review (SLR). This paper describes how the curriculum of the module was adjusted to reach the objective and how the transition to fully remote teaching during the pandemic was managed. Blackboard Collaborate was used for synchronous online teaching and student engagement was facilitated by online learning tools, which include Jamboard. Both students and lecturers generally experienced the changes as positive. Recorded lectures are considered valuable as it enables flexible learning, and online learning tools were successfully utilised to make lectures more interactive.

Keywords: Information Systems (IS) students, research paper, Systematic Literature Review (SLR), synchronous online teaching, online teaching experiences, online learning experiences, online learning tools, COVID-19

I. INTRODUCTION
In South Africa students do a three-year Bachelor’s degree in Information Systems. Studying a fourth year will get them an honours degree, after which they can enrol for a masters degree. Most honours students perform full-time IT jobs and take leave to attend their lectures on Fridays (twice a month). Students enrol for seven modules which include a research project that contributes 25% of the credits for their degree.

Initially, this research project was split over two modules: one semester module in which research methodologies were taught, and another one where the students had to write a research paper. They were given topics by the different lecturers in the department, who then acted as their supervisors. Quantitative or qualitative research was allowed.

This approach was problematic as the students firstly found it challenging to finish the comprehensive research process in the short period of six months. They grappled with the writing of a proper literature review as they had limited knowledge of and experience with search and referencing techniques, and they lacked proper academic writing skills. Secondly, the research papers they produced were not publishable due to the small sample sizes they used to gather their data. Thirdly, the student numbers for the honours programme annually increased quite drastically (from 86 in 2019 to 137 in 2021), which meant that supervisors had to spend a lot more time on supervising the rising number of students assigned to them.
To address these problems the output expected from the two research modules was changed to a systematic literature review (SLR) in 2019. Students no longer had to gather their own data, but could spend their time more effectively doing secondary research. According to Boland, Cherry and Dickson (2017), the systematic review of literature “has been accepted as a legitimate research methodology since the early 1990’s”. The advantage of doing an SLR, will teach the students to critically appraise and synthesize existing research findings. Students get exposed to different research methods and populations in the selected sources.

In 2020, the two semester modules, ‘Research Methodology’ and ‘Research Paper’, were changed into a year module named ‘Research Paper’. The focus of the new module was adjusted to mainly teach the students how to write a SLR. The practice of teaching this module is described in Section 2 of this paper. When the COVID-19 pandemic struck in March 2020, the teaching approach to the module had to be adjusted to cater for the new online environment. In 2021, the module was, from the outset, constructed as a fully online module. Section 3 deliberates on the impact of the pandemic on the educational methodology, assessment and evaluation of the module, while Section 4 provides a reflection on students’ and lecturers’ experiences of the changed approach.

II. A DESCRIPTION OF THE RESEARCH PAPER MODULE

Since 2020 the honours research paper is a year module in which students are taught to write a SLR. Two textbooks are prescribed for the module, namely Oates [2006] and Boland et al. [2017]. The module consists of 13 hour-and-a-half lectures during the year. Students are provided with a MSWord template to construct their research paper of at least 8000 words. This template (as well as the lectures) are structured according to the SLR method suggested by Boland et al. [2017]. Four assignments are done each of which builds on the previous one and allows students to work towards their final paper, the exam assignment. Supervisors work closely with the students throughout the year. General research methodologies were given as self-study, using Oates [2006], and assessed during class activities and tests.

Table 1 below provides more detail on the content covered during each lecture in 2021.

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Topic</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture 1</td>
<td>Introduction to research</td>
<td>All lecturers in the Department had to provide at least five research questions which students could choose from.</td>
</tr>
<tr>
<td></td>
<td>What is a SLR? (Boland et al. [2017] Chapter 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Choose your research question</td>
<td></td>
</tr>
<tr>
<td>Lecture 2</td>
<td>Planning your SLR (Boland et al. [2017] Chapter 2)</td>
<td>A plagiarism lecture was given and Turnitin was used to check all submitted student assignments.</td>
</tr>
<tr>
<td></td>
<td>Research Paper Structure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Informal class activity (Plagiarism)</td>
<td></td>
</tr>
<tr>
<td>Lecture 3</td>
<td>Drafting a title, identifying key words, writing an introduction, identifying search terms</td>
<td>Students had to use a referencing management tool, applying the APA 6th, APA 7th or Harvard referencing style.</td>
</tr>
<tr>
<td></td>
<td>Referencing</td>
<td></td>
</tr>
</tbody>
</table>
- Performing scoping searches
- Online Quiz: Chapters 6 (Literature Review) and 7 (Surveys) of Oates [2006]

**Lecture 4**
- EndNote training
- A Blackboard Quiz had to be completed online (with limited time) during the lecture.

**Lecture 5**
- Inclusion and exclusion criteria (Boland et al. [2017] Chapter 3, 4 & 5)
- Source selection
- Research protocol
- Students were encouraged to use at least 3 online databases available via the university’s library.
- A completed research protocol addendum was added to the assignments and the final research paper. This included the title of SLR; research question; research problem; objectives; keywords; search terms; sources used; and the inclusion and exclusion criteria.

**Lecture 6**
- Study selection process; data extraction (Boland et al. [2017] Chapter 6)
- Online Quiz: Chapters 13 (Interviews), 14 (Observations), 15 (Questionnaires) and 16 (Documents) of Oates [2006]
- The PRISMA flow chart [Moher et al., 2009] was recommended as a way to visualise the study selection process. Since the SLR in the module is a qualitative study, thematic analysis was covered in this lecture to prepare students to identify codes, sub-themes and themes to include in the data extraction table.
- A Blackboard Quiz had to be completed online (with limited time) during the lecture.

**Lecture 7**
- Data extraction (Boland et al. [2017] Chapter 6)
- Online Quiz on thematic analysis, referencing and alignment between title, research questions and keywords.
- A thematic analysis workshop was held to teach the concepts of data extraction. Jamboard was used (see Section 3.2 for details)
- A Blackboard Quiz had to be completed online (with limited time) during the lecture.

**Lecture 8**
- Defining and applying quality assessment criteria (Boland et al. [2017] Chapter 7)
- Setting up Quality Assessment questions was explained, as well as how these should be answered to prove the quality of included papers.
III. THE IMPACT OF THE PANDEMIC ON THE EDUCATIONAL METHODOLOGY AND ASSESSMENT OF THE MODULE

In 2019, lectures for the research modules were presented as face-to-face meetings on campus. Assignments were submitted on Blackboard as Turnitin assignments and marked online using pre-designed rubrics. No recordings of lectures or online quizzes were done and all class activities were conducted using pen and paper during the face-to-face lecture sessions. Students also scheduled face-to-face meetings with their supervisors after class.

During the first three months of 2020 (the academic year starts in January), the same teaching practices were followed. On 26 March 2020, the university was closed down for almost 2 months in accordance with the lockdown regulations, and only re-opened in May 2020. All teaching activities had to move online. The teaching practices for the Research Paper module were adjusted to narrated PowerPoint presentations which were published on Blackboard. A lecture schedule with deadlines was also published and students could work through the content in their own time. Only a few synchronous lectures were presented online via Blackboard Collaborate, towards the end of the year, to allow for questions and to ensure that everyone was still on track. Class activities were converted into online Blackboard class assignments and had to be completed as per the schedule published. The meetings with supervisors also moved online (usually conducted via Google Meet).
In 2021 the module moved to a fully online module and online synchronous lectures were scheduled, presented and recorded via Blackboard Collaborate. During these lectures the lecturers made use of online PowerPoint Presentations, YouTube videos, the Blackboard polling functionality and Jamboard to convey the course content, while online Blackboard quizzes were used to replace the class activities.

The next section will briefly discuss the use of some of the online teaching tools in 2021.

The use of Blackboard’s Polling functionality
Blackboard provides a functionality to conduct live polling during an online session. Students can see the question, the options from which they can choose as well as a live update of the poll result.

One example of how the tool was used is to assess students’ understanding of the different parts of a well-written introduction. The introduction sections of a few SLRs (which the students had access to) were used. The poll showed a sentence from the intro and students had to decide what the role of that sentence was measured against the five parts of an ideal introduction section (in the form of a multiple choice question).

In another live poll, students’ argumentation skills were assessed. They were made aware of the fact that an SLR is an argument with sub-arguments after which the different parts of an argument were revised. Using a poll, students had to identify the different parts of an argument taken from the abstract of a provided SLR.

The use of Jamboard
Jamboard is a digital whiteboard that works with the G-suite services. It allows for teams to work together in an online environment and includes functionalities such as writing and drawing while anonymously sharing with everyone who has access to the board. Jamboard was used on two occasions. The first was during an online workshop on thematic analysis, where the lecturer illustrated how to discover themes from an article which was to be included in a SLR. Students were divided into three groups of fifty each (using their surnames). In preparation for the lecture, the lecturer constructed three jamboards for each group with a quote from an example article on each. The link to these boards were shared with the students during the Blackboard online lecture, using the online chat function. Students used their link to access their group’s jamboards and used sticky notes to propose the theme they would extract from the quote. Lecturers were able to view all the jamboards and provided verbal feedback on the students’ contributions while the Blackboard lecture continued. Figure 1 shows an example of one of the jamboards constructed by the students during this session.
The second application of Jamboard was to practice the art of paraphrasing. Paraphrasing forms an important part of the skills needed to write a good discussion. It is the process in which one uses your own words to accurately express the ideas or message written by someone else [Gahan, 2021]. During this online Blackboard lecture, students were given a quote and asked to paraphrase it on a Jamboard. Lecturers were able to provide feedback as attempts were posted, assisting students to change or better their final answers. Figure 2 shows an example of students paraphrasing attempts. The quote students had to paraphrase is given at the top of the figure.

### The use of online quizzes

Four of the class activities were converted into online quizzes in 2021. Two quizzes were designed to evaluate students’ knowledge on the content of the Oates [2006] prescribed textbook. The remaining two quizzes were directed to the general aspects needed to write a good academic paper, and included topics such as thematic analysis; referencing; the alignment between the paper’s title, research questions and keywords and the place of an SLR amongst literature reviews. Quiz questions were mainly application questions aimed at testing the students’ ability to apply their knowledge. See Figure 3 for an example question from one of the quizzes.
IV. DISCUSSION OF EXPERIENCES

In this section the experiences of and feedback from both the students and lecturers will be discussed.

**Student experiences**

Student feedback on the Research Paper module in 2020 and 2021 indicated that they value the research and job-related skills they obtained through it (see Table 1 for a summary of the feedback on the question whether the module met their expectations).

Table 1: Feedback on the value of the skills obtained by students

<table>
<thead>
<tr>
<th>Skills obtained</th>
<th>Student response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valuable research skills</td>
<td>“This course changed the way I view the world. It’s been hard for me but also motivated me to learn more and continue studying - it made me love academics (as hard as it is)” (2020); “It did (meet my expectations), and I'm excited to continue with my research” (2021); “Provided solid base for proper research” (2020)</td>
</tr>
<tr>
<td>Valuable job skills</td>
<td>“The module did meet my expectations, I have learned a lot that I will be implementing in my work situation” (2021)</td>
</tr>
</tbody>
</table>

Another question which provided insightful feedback was: How did you experience the online teaching during COVID-19? The feedback to this question is summarised in Table 2.

Table 2: Feedback on students’ experience of online teaching during COVID-19

<table>
<thead>
<tr>
<th>Emerging themes</th>
<th>Student Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are in this together</td>
<td>“It was difficult at first but became easier as we went along. It helped that both students and lecturers went through this process together so there was a lot of understanding from the lecturers” (2020);</td>
</tr>
</tbody>
</table>
“The presenters were very accommodating, and used all the tools at their disposal. I will do online classes again.” (2020);
“The lecturers did a great job to help the students” (2021)

<table>
<thead>
<tr>
<th>Balancing work and studies</th>
<th>“Great learning experience because I am working in corporate on the side. The online saved me time to travel to and from varsity.” (2021); “I prefer online classes, then I don’t have to take so much time off of work” (2021)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The value of pre-recorded and recorded lectures - learning anytime, anywhere</td>
<td>“I like the pre-recorded lectures a lot more than sitting in class after 5” (2020) “Enjoying online learning coz i stay safe and also learn anywhere in the world” (2021) “I preferred it to physical lessons, because I had recording to go back to” (2021)</td>
</tr>
<tr>
<td>Need for face-to-face interaction with supervisors</td>
<td>“Online teaching was not difficult although contact sessions with supervisors would be very advantageous when evaluating students’ articles.” (2020) “Lecturer did everything in their power to enhance online 780 experience for students, however, I find it better to grasp concepts in person. Working with my supervisor physically could have bettered my experience.” (2021)</td>
</tr>
<tr>
<td>Need for face-to-face interaction</td>
<td>“I really liked it. Missed going to Addler’s [coffee shop on campus] after classes though.” (2020) “Missed F2F, but specific for this module it was satisfactory” (2020)</td>
</tr>
<tr>
<td>Engaging, interactive and fun</td>
<td>“This module has navigated it well, and it still felt engaging” (2021); “It was not so bad, the lectures engaged well with students limiting any confusion and the classes were interactive which made it interesting” (2021); “It was fun and interactive” (2021)</td>
</tr>
</tbody>
</table>

**Lecturer experiences**

2020: The switch from face-to-face teaching to a fully remote teaching approach was sudden and resulted in some challenges: many students did not have off-campus access to devices and/or data; some students’ living conditions were not ideal for studying; the learning material and assessment activities were not suitable for online learning and the teaching schedule had to be adjusted numerous times. Due to the uncertainty regarding time tables and reliable digital access, live lectures were replaced by pre-narrated PowerPoint slides with clear guidelines on the study material to be covered in each study unit. The teaching method during this period resembled what Hodges et al. [2020] describe as emergency remote teaching - the teaching which results from a swift move from face-to-face teaching to remote teaching, as a temporary, emergency solution. The focus remains on maximum availability of study material to as many students as possible. It lacks the careful planning associated with fully online courses which may result in lower quality teaching and learning [Hodges et al., 2020]. Regardless of this, the course still reached its objectives as reflected by the general good quality of the students’ final SLRs.

2021: Being more comfortable with a fully virtual teaching environment, the lecturers (due to their residential university mindset) still wanted some synchronous interaction with their students, and thus presented live lectures via BlackBoard Collaborate. To encourage “class attendance”, polls and Jamboard were utilised to facilitate engagement and interactivity. Jamboard is particularly well-suited for promoting interactivity, and was used
quite successfully for that purpose during the pandemic [Ahshan, 2021; Gallagher & Vance, 2021; Pothier, 2021]. Student feedback confirmed that this goal was reached and a consistent class attendance of above 80% was managed. From a learning perspective, the use of Jamboard to present a thematic analysis workshop had mixed success. Not all students participated and the complexity of the assignment made it hard to illustrate all parts on the online platform. Ahshan [2021] implemented Jamboard very efficiently in engineering education by having pairs of students working on one Jamboard with the lecturer moving between the different groups’ boards. Smaller groups could have increased the level of participation but the large number of students made it difficult to implement. More time needs to be allocated to this workshop to ensure that students practice the skill. The same applies to practising the skill of paraphrasing. However, students still seemed to enjoy the interactivity and the fact that they could see each other’s contributions.

2022: Jiang et al. [2021] argue that online learning often imposes extra cognitive load on students due to what they call the split attention effect. This is where students have to “distribute their attention between physically or temporally separated but interrelated sources of information” (p.10). A synchronous online learning environment typically contains a presentation screen and message facilities with message threads. Students have to mentally integrate these sources to follow the conversation, resulting in high cognitive load [Jiang et al., 2021]. A combination of face-to-face and online learning would be ideal. Nevertheless, students and lecturers have been exposed to a range of novel, complex learning environments during this pandemic. This created expectations. It is clear that there is no going back to the good old days but what seems to be unclear is exactly how learning environments will change in future.

Publications resulting from the research paper module
An important positive result of the move to a SLR as output of the module, is the publishability of the work of some students. Up to date, 10 conference papers published in the Springer Lecture Notes series resulted from the research module presented in 2019 and 2020. See Appendix for a list of the published papers.

V. CONCLUSION

The output of the research paper module in the honours degree at the University of Pretoria, evolved over the past three years from a short, traditional research paper to a SLR. The move towards this standardised approach seems to have many benefits. An important academic skill, namely to write a quality SLR, is practiced and assessed in detail and has resulted in more publishable research papers.

In addition to the adapted curriculum, the lecturers were forced to move from face-to-face teaching to fully remote teaching, due to the COVID-19 pandemic. Despite the many challenges faced and the forfeit of face-to-face interaction, students and lecturers experienced these changes as positive. Recorded lectures are considered valuable as it facilitates flexible learning and the use of online learning tools were successfully used to make lectures more interactive.

The potential of online teaching tools is realised but lecturers in addition value face-to-face interaction. A mixed teaching approach appears to be the way forward, where online learning could be used to teach certain content, while physical learning spaces seem to be necessary for the mastering of other learning objectives. The teaching of writing skills and data analysis is ideal for such spaces where verbal and non-verbal communication could lead to spontaneous discussions on the content, which is less probable to happen in an online environment.

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https://doi.org/10.3390/educsci11090483


### APPENDICE


