“Assessing the confidence of sociology students on using quantitative research methods through Technology Enhanced Learning”

Christos Balafoutis

Abstract

This research aims to investigate the ways Technology Enhanced Learning can facilitate the learning of quantitative research methods in social sciences degrees. Specifically, how sociologists tend to avoid statistical modules due to anxiety and inadequate teaching methods. Digital competency of sociologists is a crucial debate in the literature and technological developments provide a useful tool for learning, which however in not being exploited enough. This study explores how Computer Based Learning, Computer Assisted Learning and Computer Supported Collaborative learning sessions can address the increased statistics anxiety observed in students that study social sciences.

The analyses corroborated the main assumptions drawn in the relevant literature. Students in social sciences tend to present social anxiety and dissociate from quantitative methods, lacking a crucial tool for their future as social scientists. Technology enhanced learning methods were found to be effective in the acquisition of knowledge and understanding of quantitative methods. Participants highlighted the need of technology to be an integral part in learning, that extended communication between students and teachers is beneficial, that future technologies must be an ongoing part of curriculums and institutions should focus on equipping students with the ability to use digital tools for their future employment.

Consequently, further research is recommended on the ways institutions should respond to the digital transformation of the social sciences and education, on how to integrate new technologies without ignoring the beneficial contribution of current and established methods, and on what the future brings for contemporary social sciences in the dawn of artificial intelligence.

Keywords: active learning, enhanced learning environments, pedagogical socialisation, quantitative methods, statistics anxiety

Introduction

Without doubt, the scientific field of social sciences is heavily dependent on statistics and accurate analyses. Especially in sociology, the collection and appropriate interpretation of data is considered vital for the understanding of society and social change. For the interpretivism school of thought, the continuous development of the main subject of examination and the constant transition from one stage to another

significantly affects societies and attitudes in an abrupt manner (Craver, 1982), hardening the task of "quantifying" data (Apter, 2021). On the contrary, the positivism school of thought opposes mere theoretical interpretation, suggesting that sociology is also a natural science and the application of scientific methods to research is necessary to produce objective results (Holder, 2016). Nevertheless, the debate extends from the methodological to the practical scope as sociology students are frequently challenged by the epistemological legitimacy of statistical research methods and present high levels of anxiety during the learning process (Ralston, 2020). The implementation of Technology Enhanced Learning (TEL) methods, such as Computer Based (CBL), Assisted (CAL) and Supported Collaborative Learning (CSCL) have been found to be effective in creating a "non-threatening" learning environment, allowing students to familiarise with quantitative methods (QM) and allowing them to acquire knowledge of a vital tool for the discipline (Kolpashnikova & Bartolic, 2019).

The purpose of this research project is to investigate the benefits of employing technological advancements in the learning process of statistical methods at a prominent university in London. This study aims to assess how TEL, specifically practicing on statistical packages, can facilitate the acquisition of knowledge of quantitative methods, a traditionally demanding task for social sciences students. This small-scale research attempts to record the views of third year sociology students from a prominent university in London, regarding the effectiveness of Technologically Enhanced Learning sessions to establish an inclusive learning environment, provide them with new skills and ultimately boost their confidence to utilise statistical packages like SPSS in their educational and professional future.

Background context

Incorporating educational technologies in learning has been proven to be effective in improving the learning experience of students across many disciplines (Akintayo et al, 2024). Technology Enhanced Learning practices are commonly employed to address a series of difficulties that students face with demanding tasks in education, as well as challenges in the learning environment that fall outside the cognitive spectrum, such as lack of pedagogical socialisation (Kurniawan & Wahyuningsih, 2018). An indicative example in the field of social sciences is the difficulty of sociology students to learn quantitative research methods, an inherently negative attitude towards them, and a reluctance to use them in real life projects. New technologies have not only created a "quantified self" for the field of sociology, but have provided valuable tools to facilitate the acquisition of knowledge of QM more effectively than the traditional "talk and chalk" format (Kolpashnikova & Bartolic, 2019). Namely, exploiting statistical packages such as SPSS during the teaching procedure can successfully address main issues such as a) superficial teaching b) linking theory with practice c) unfamiliarity with concepts and content d) the negative predisposition of students towards QM (Mireles, 2023)

As TEL is an interdisciplinary and dynamic field in a constant process of redefinition, as new technologies emerge (Kyza, 2019), definitions were selected to scientifically frame the actions of the examined students to practice with SPSS in campus or at home, engage with online tasks and tutorials, and co-operate with each-other as a way to enhance their understanding, and towards the acquisition of knowledge (Sen & Leong, 2020). Thus, drawing from the respective literature, the terms Computer Based and Computer Assisted Learning were used to describe *"using computers for instructional purposes, whereas the hardware, software, peripherals and input devices are key components of the educational environment"* (Isaias et al 2020, p. 81) and *"using tutorials, simulations and problem-solving approaches to present topics, enhance students 'understanding and facilitate self-directed learning"* (Sharma, 2017 p. 102). The term Computer Supported Collaborative Learning was used to describe the process whereas *"technology is used to promote joint construction and sharing of knowledge among participants through interaction and communication"* (Pavo, 2021, p. 22).

Research design

In order to record the views of students regarding the topic, the main methodology for this project is phenomenology, as it is the most consistent method for constructivist theoretical analysis (Celis et al, 2019) and is particularly suited to capturing the depth and richness of personal experiences, allowing an in-depth examination of how students engage with SPSS as a pedagogical tool (Neubauer et al, 2019). Phenomenology seeks to understand how individuals perceive and make sense of the world around them through their subjective experience. Rather than functioning solely as a methodological tool, phenomenology represents a theoretical stance that centres on how individuals construct meaning from their subjective experiences (Heotis, 2020).

Data collection through semi-structured interviews facilitates focusing on participants' perceptions, emotions and reflections related to their use of SPSS in the learning environment. Subsequent thematic analysis is employed to analyse the data, enabling the identification of key patterns and themes that reveal how students experience and interpret this form of TEL learning. The flexibility of thematic analysis is well suited for the phenomenological approach of this research, aiming to remain close to participants' opinions while systematically interpreting the data (Braun & Clarke, 2021). Ultimately, the phenomenological approach combined with thematic analysis provides a comprehensive and exhaustive analysis of the experiences of students, allows the exploration of unique perspectives, and the extraction of conclusions based on lived experiences (Delve & Limpaecher, 2023).

Qualitative research methods are used frequently in order to understand complex social phenomena and social aspects, based on non-numerical data. Although the examined topic is not a social phenomenon per se, it presents similar characteristics due to the multiple interactions between individuals, settings, and

events, that shape behavioural reactions (Sirisilla, 2022). The benefits of qualitative methods to identify "values, assumptions, expectations and behaviour" have been established long ago in social sciences (Whitt & Kuh, 1989, p. 4) and have been regularly employed in research relevant to higher education in the pursuit to understand the dynamics between functions, individuals and a given societal and/or physical context (Chesnut et al, 2018). In addition, qualitative methods are considered superior for the objective examination of settings, as the researcher does not interfere with any of the environmental aspects, enhancing the descriptive ability of the chosen methodological tool and allowing the exploration of "what is happening" prior to the examination of "why is it happening?" (Bogdan et al, 2006). Ultimately, the input of data comes in the form of observations, words, and texts, aiming to provide fruitful insight on human activities and opinions from the participants 'point of view, allowing the analysis of a purposively selected sample that represents the physical/social context in question (Savenye et al, 2005).

Although data collection practices in relevant work utilise mostly questionaries to retrieve information in regard to the challenges faced by students in quantitative methods modules (Murtonen et al, 2010; Murtonen et al, 2008) their format provides a limited range of responses and hardens adjustments that might be necessary during data collection (Phellas et al, 2011). In order to address those limitations and methodologically match the constructivist and phenomenological approach of understanding and recording human experience, the preferred method for this project was semi-structured interviews, aiming to "foster an environment where the ideas and meaning can be developed and further discussed in order to achieve a deeper understanding of the phenomenon under investigation" (Reza et al, 2014, p87). Ultimately, employing semi-structured interviews as the method of data collection provided students with the opportunity to express their own experiences while facilitating discussion, aiming at uncovering particular themes in their responses and shape an overall pattern of the key issues faced by them during the learning process. Interviews were conducted online through MS Teams and in one-to-one format to allow timely collection and ensure the privacy of participants.

The questions for the interviews were designed based on the rationale of extracting "word themes" that can describe the views of students. The size of this project and the fact that it was conducted by one author restricted the ability of quantitative measurements of "students 'opinions". As a result, interview questions were structured in a manner to identify key words that would ascribe a positive or negative sign to students 'experiences and answer the following research questions:

- What are students' views toward quantitative methods and the respective modules?
- In what ways has CBL, CAL and CSCL facilitated the learning process of quantitative methods?
- How confident do students feel about employing quantitative methods in real life research projects?

- What are the particular skills students believe they have developed through the implementation of CBL, CAL and CSCL in quantitative methods?
- How can CBL, CAL and CSCL sessions improve to maximise learning efficacy?

Results

The sample for this project consists of 10 third year students that have completed the respective QM modules at a prominent university in London. Participation in the research was voluntary; thus, the profiles of the respondents have not been chosen strategically. Prior to any communication with the participants ethical approval was granted by the Research Ethics Committee and the head of the Department of the examined university, in compliance to the British Educational Research Association Ethical Guidelines.

Half of the respondents were from a country within the EU, 2 were British, 2 were from the US and 1 from Russia. In three occasions participants added a second nationality, identifying as British-Kurdish, US-Italian and Cypriot-Greek. Of the four programmes of social sciences, 2 of the participants were enrolled in Sociology, 2 in Criminology, 3 in Sociology and Criminology and 3 in Sociology and Psychology. Finally, in order of preference on using statistical packages 5 respondents chose SPSS, 2 were comfortable with using STATA, 1 with ArcGIS, 1 with Python and 1 with R. Also, 5 of the respondents expressed positive feelings towards this research practice, while 2 had a mostly negative opinion. The remaining 3 students had mixed views towards QM, depending on the task at hand, what would be required from them to do and how comfortable they would feel to complete it.

Following the attribution of a quality towards their feelings for quantitative methods, students assessed their views on QM as a methodological task. The main theme that emerged was the recognition of the value of QM research methods from participants. Opinions were divided at this point, as there was a clear distinction between the importance of the research method and how easy it is to conduct that type of research. Overall, three combinations were identified: Easy and useful, hard and useful, and hard and less useful. Furthermore, students identified a series of reasons for which they found learning quantitative methods challenging, regardless of if their views were positive or negative. The most cited issue was the lack of previous experience, which was mostly associated with the format of the secondary level of education in the countries of origin of students and the educational differences with the UK. Additionally, the aforementioned differences were also connected to what students described as “language barrier” and their difficulty to understand the respective terminology in English. Other reasons were the abstract nature of mathematics, the constant development of the scientific field of social sciences and the perception that quantitative methods are less suitable to examine social phenomena.

The second part of the interview focused on identifying if and how CBL, CAL and CSCL sessions facilitated the learning process of quantitative methods at the examined university. Similarly to the first part, the main theme that was observed was the positive stance for the examined learning methods. Out of 10 students, only 1 found the sessions not being helpful. Furthermore, 9 respondents made a distinction between improvement of their attitudes and confidence to use quantitative methods, improvement of their understanding and the overall improvement of the learning environment. The majority of students, 9 out of 10, stated that technologically enhanced sessions improved their motivation and strengthened their understanding of the utility of quantitative methods. 5 of the respondents added that CBL, CAL and CSCL made the topic of research methods overall and quantitative methods specifically more interesting, easier, and friendly, while it also improved their attitude towards mathematics and statistics.

As the interviews progressed, through the discussion with the researcher, the participants highlighted the technical characteristics that, according to their opinion, were improved through their involvement with technologically approached learning methods. The main theme observed was the enhanced motivation, confidence and understanding of students. First on the list was the ability to practice and engage remotely in their own time, that led to deeper engagement with the topic and the respective statistical packages that were used. Additionally, they found it easier to link theoretical concepts to real-world applications and increase their understanding, flexibility, and readiness to utilise quantitative methods. Also, the availability of online tools and the adaptation of the learning environment to a game-type session provided students with a safe environment to make mistakes without the feeling of being judged or assessed, increasing their overall confidence to further engage with the lesson and their peers.

Regarding the confidence of students to employ quantitative methods in real-life projects replies were balanced between positive and mixed. The main theme observed was an increased confidence to employ QM, however that was dependent to the task at hand. 4 students stated confident or very confident to use quantitative methods in a real project, assessing that they have acquired an adequate expertise on the topic which has grown significantly while practicing them. Another 4 students stated relatively confident, highlighting the differences between academic and professional settings, the quality of the datasets that are used in academic sessions compared to real-life projects, as well as external factors such as the existence or not of a tutor-helper that could provide insight in the process. Furthermore, they associated their confidence to employ quantitative methods to the individual task at hand, feeling more comfortable to conduct simple analyses, such as descriptive statistics or regression tests with one variable. Finally, only 2 students did not feel confident to utilise quantitative methods in real-life settings. Respondents assessed their abilities as inadequate for a real-life project and felt unassured to implement them in a non-educational setting, emphasising on their preference to use qualitative research methods instead.

When asked about the skills they believe they have developed through their interaction with CBL, CAL and CSCL sessions, students made a distinction between technical and social skills. The main theme observed was an overall improvement of research and maths skills, and pedagogical socialisation. Initially, respondents focused on those skills that helped them learn and understand quantitative methods, such as developing their critical thinking, making evidence-based decisions, as well as their mathematical and research skills. The most popular responses, 8 out of 10, were the enhancement of their problem-solving abilities and improvement of complex analytical skills. Also, 7 students identified an improvement in their skills in using statistical packages and relevant software, as well as understanding the main principles in programming. Students also stressed the importance of improving their skills on a social level. Working with peers not only enhanced the socialisation of participants but also promoted learning as it created a "community feeling" where participants interacted towards a common goal. According to the respondents collaboration between students also raised their confidence and motivation to engage more with the learning material, as it created a safe environment to express gaps in knowledge and understanding.

For the last part of the interview, students were asked to share their ideas regarding the ways CBL, CAL and CSCL sessions could improve. Two major themes emerged during the discussion. The first one was a series of technical characteristics that can improve direct involvement with statistical packages and provide students with the ability to engage with them remotely. The second theme was focused on enriching the sessions with more real-life and cross-disciplinary examples and the addition of alternative statistical software that could facilitate future employment of students. Specifically, 9 out of 10 students suggested that they would benefit from more real-world problem-solving exercises and projects that would have a universal application to scientific fields similar to sociology, such as anthropology and geography. Furthermore, they considered it of immense importance to improve the feedback process on their tasks and provide more online tools, such as technical support and access to more programs, and helping material, such as video tutorials and online examples. Students also suggested the addition of statistical packages, such as Python, R and SQL, that would help them with future employment. Furthermore, adaptations towards a "universal module" that would be valuable for employment and further studies too, as in many cases there is a huge gap between theory and practice within and across educational institutions, as well as the workplace. Finally, respondents highlighted the importance of taking in consideration emerging technologies, such as Artificial Intelligence, especially in a constantly evolving scientific field such as social sciences.

Overall, respondents provided valuable insight regarding their learning experience of quantitative research methods and the effectiveness of CBL, CAL and CSCL sessions at the examined university in London. Students assessed their attitudes towards quantitative methods as mostly positive, while making a distinction between emotional and practical challenges. Also, they identified the importance of interacting

with technology while learning, towards improving the learning environment, as well as their individual perceptions towards quantitative methods. Technologically enhanced and online environments can boost the confidence of students to learn and employ quantitative methods, as well as improve their socialisation through a combined pedagogical and social framework.

Discussion

The mixed perception of students in learning quantitative methods:

Although the majority of the literature indicated that students have a mostly negative attitude towards quantitative research methods, this assumption could not be fully confirmed by the examined sample of this research. At least 5 of the respondents commented positively about quantitative methods as a theoretical framework and research tool and justified their opinion by listing a series of methodological advantages, such as the enhancement of data validity and reliability, the objectivity in data collection and the degree of simplicity to analyse data and results. A smaller proportion of the sample, 3 out of 10 had an ambiguous stance, expressing positive feelings towards the examined research method, however, highlighting that this was dependent to the respective task they would be required to fulfil. Nevertheless, they still recognised the advantages of quantitative methods and their importance in conducting sociological research, similarly to Chamberlain's (2015) work, where students found utility in quantitative methods, however remained negative towards the overall research practice, although they perceived it as vital knowledge for future studies and employment.

A small minority of 2 students within the examined sample had a totally negative attitude towards quantitative methods. As with the rest of the sample, respondents justified their views with contrary arguments, characterising quantitative methods as demanding, unimportant, complicated, and unable to provide insight. On methodological level, responses were in agreement with Apter's (2021) assumptions that students find it hard to associate quantitative methods with social sciences, mainly due to the fact that social sciences are a constantly evolving field, thus, they cannot find utility in an "objective research tool" for the examination of social phenomena that are bound to "subjective" data and circumstances. Nevertheless, besides what students described as "abstract nature of maths", their reluctance to use quantitative methods was also associated with a series of educational issues. Participants highlighted the differences between transnational educational systems, which in turn was considered a main reason for the lack of prior experience with maths and statistics. According to Blaike (2011) students tend to avoid subjects related to mathematics, however, respondents indicated that it was less a matter of personal choice and more of an institutional and systemic requirement. For most students, their potential choice of studies was directly connected to the subjects taught during their secondary education, thus, those who wanted to study social sciences were involved with theoretical modules such as history, languages and

sociology, rather than hard sciences like maths, physics or chemistry that would be the requirements for someone who would study the respective subjects in Higher Education.

Overall, the fact that at least 8 students had a positive attitude towards quantitative methods cannot be ignored for its descriptive value, however, it cannot be formally assessed in this project if this is the result of a general shift in the views of students, that would be in contrast to the established notion of them being negatively predisposed towards QM, or a random occurrence. Nonetheless, there is convergence between theory and responses regarding negative attitudes that were expressed during the interviews. Students were less comfortable to explore quantification in their work due to their lack of prior experience (Espeland & Stevens, 2008), that consequently led to facing difficulties in learning quantitative methods in Higher Education and in turn an inability to find applicability in social sciences (Murtonen et al, 2010).

Practice with CBL, CAL and CSCL can improve the learning environment and enhance acquisition of knowledge:

Regarding the ways CBL, CAL and CSCL facilitated the learning experience of students, there was a distinction made from respondents between “emotional" and “practical” level. Initially, 9 out of 10 students agreed on the positive effects that technology enhanced sessions had on their motivation to learn and engage with quantitative methods and how the learning environment was improved through active learning, which is a fundamental goal for Computer Based and Computer Assisted Learning (Oliveira et al, 2013). According to the participants, their involvement with the practical aspect of quantitative methods made the subject interesting, friendlier to learn and enhanced their understanding, as it allowed them to explore and apply their knowledge, increasing their satisfaction and willingness to participate (Robertson, 2018). Furthermore, a series of benefits were expressed for the Computer Supported Collaborative part of the sessions. Working with peers created a dynamic and safe learning environment by promoting, what Eshet et al (2021) termed as, a “community feeling”. Additionally, collaborative work managed to eliminate phenomena of social and statistics anxiety, as students had the opportunity to exchange knowledge and test their skills by helping each other, perceiving the sessions as a game type activity without the fear of being formally assessed or judged for their errors (Detrlor et al, 2022).

On the practical aspect, three main conclusions concurring with the relevant literature were drawn from the interviews. First, the examined learning methods increased students ’flexibility to practice on their own time and self-regulate their studying, allowing them time to get engaged with the material in their own pace, manage their cognitive goals and fulfil learning tasks easier (Miller, 2019). Additionally, the availability of a variety of online tools and information facilitated the learning process, as it provided students with the opportunity to explore and work with real-life examples, effectively linking theory with practice and eliminating prior lack of experience and unfamiliarity with concepts and content that were

relatively unknown to them (Murtonen et al, 2010). Finally, participants highlighted the practical benefits of collaborative work and active experimentation in class, as regulated cooperation between peers allowed the construction of knowledge, not only by removing stressful factors through socialisation, but also by allowing students to allocate tasks according to their individual needs, confirm their work through direct "reflection of doing" and instant feedback from peers (Dietz, 2012) and fill gaps in their knowledge through reflective observation as tasks were fulfilled by the inner-team towards a specific and collective goal (Williams & Payne, 2011).

Hence, it can be assessed that the examined sample experienced and identified the advantages of CBL, CAL and CSCL on their motivation and satisfaction, as those were theorised by Rubens & Southard (2020) and others, as well as to their overall learning experience. Also, the fact that students explicitly expressed their satisfaction with technology enhanced sessions, associating them with a significant degree of improvement to their performance, contradicts the notion of Allen and Baughman (2016) that gratification and enjoyment are, on instances, unrelated to educational attainment and acquisition of knowledge. Finally, students found collaboration with their peers being quite beneficial to their learning and socialisation, thus the counter-effect of learners feeling socially anxious and deviate from their educational efforts (Pfeffer & Rogalin, 2012) was not observed in this project.

What regulates the confidence of students to use quantitative methods in real-world applications:
From the sample of 10 students, 4 of them were positive and very confident to employ quantitative research methods in real life projects, assessing that they have developed an adequate level of expertise in order to embody quantification to their work. Likewise, 4 students felt relatively confident to use quantitative methods in real life circumstances, depending on the required task and the overall context. According to the participants, although their interaction with real-life examples was beneficial to their understanding and skills, they would not feel comfortable to operate functions not known to them from their practice, which delimits their abilities to the creation of descriptive representations such as tables and graphs and simple regression and correlational analysis with a few variables. Furthermore, students expected a decline in their confidence to use quantitative methods, proportional to the differences between a real and an academic research environment. The respondents estimated that the absence of a tutor and relevant guidance, as well as the interpretation of "non sterilised" datasets like the ones used in classroom examples, would pose a significant difficulty, and would affect their confidence negatively.

Also, a minority of 2 students in the examined sample would not feel at all comfortable employing quantitative methods in real-world projects. On top of the aforementioned reluctancy expressed in methodological terms, such as the inability to find utility in quantitative methods for social sciences projects, students expressed a general lack in their confidence that stems from gaps in their knowledge, the

difficulties faced by them to learn and the overall subsequent psychological impact it has on them. Initially, criticism was focused on educational structures, such as the effectiveness of learning methods, availability of learning tools and the duration of sessions. Furthermore, the lack of options tailored to students ' individual learning needs, such as one-to-one sessions or the allocation of teams based on skill rather than overall performance, that would also require a specific approach to facilitate the participants 'learning needs. Finally, the part of the sample that presented a more negative opinion during the interviews highlighted the preference to use qualitative methods, emphasising on the advantage of stressless procedures. Overall, that smaller part of the total sample came close to what Ralston (2020) described as students 'feeling threatened by statistics and maths anxiety and avoid using them, adding to the still relevant argument of Sokolovska (2010) regarding the education of sociologists and how current programmes prepare students for real life.

The positively expressed sample mainly confirmed Stockemers '(2019) conclusions that practice on real-life examples can transform quantitative methods to a vital tool for students and increase their confidence to use them, develop them in concepts such as research design, analysis and formation of research questions and hypotheses. Nevertheless, students set boundaries to their abilities, recognising the constant need of practice and studying in order to excel in quantitative methods research and in many cases highlighting the environmental attributes that can affect their confidence. As Iuzva (2017) suggests, academic settings can boost the overall confidence of learners to use quantitative methods, which however is not always the case when students are on their own. The rest of the sample was not confident with quantitative methods and expressed similar characteristics to Thomas '(2021) criticism on the mono-disciplinary learning approach, also pointing towards Ralston's (2020) opinion for the necessity of education institutions to focus on establishing the epistemological value and ensure the appropriate teaching of quantitative methods in social sciences.

Development of skills and pedagogical socialisation:

The assessment of students 'confidence to employ quantitative statistics in real life projects highlighted the difference expressed by experts between adequate understanding of quantitative methods and intellectual sufficiency to apply them (Skott, 2013). Therefore, the subsequent part of the interview was more narrowed in focus, aiming to reveal the individual skills that students believe they have acquired and developed through CBL, CAL and CSCL and evaluate their effectiveness to the learning of quantitative methods through peer-to-peer learning, application of methods in real-life examples and practical activities (Halpern, 2016). A pattern that was observed in the responses of the participants was the categorisation between practical and social skills. The development of problem-solving abilities was the most common in the responses, followed by critical thinking, improvement in research skills and overall technical abilities, such as understanding the principles of statistics, programming and making evidence-based decisions.

Overall, students characterised the sessions effective in creating a safe environment where their skills could be tested and their literacy could develop by "integrating knowledge into existing knowledge" (Detlor, 2022). As it was expected, problem-based activities that had the layout of a game metaphor, managed to remove common stressful factors of traditional learning methods for most of the participants and allowed them to progress towards the fulfilment of different learning tasks without undermining their cognitive and behavioural circumstances (Talan, 2021).

Furthermore, the social aspect of the examined learning methods was considered by the majority of students, 9 out of 10, as a vital component to the aforementioned procedure. Initially, working with others during sessions improved their collaboration skills, especially in comparison to other modules where students are expected to operate on their own. In turn, it also improved their communication skills, as the sessions would mimic real-work teams, where effective transactions and support between peers are required to successfully reach a goal. Consequently, it can be assessed, through the reflection of students ' views, that the examined sessions were successful into minimising the fast paced and demanding nature of learning quantitative methods and make them more personal, engaging, and inclusive (Nind, 2020). Overall, the experience of students can be summarised as a learning environment where they could communicate thoughts and share concerns, ultimately boosting their motivation to learn and advancing their skills through cooperation, achieving what Thomas (2021) described as pedagogical socialisation.

Finally, students highlighted that interaction with peers managed to alter contextual dynamics in a way that it lessens their anxiety, as the feeling of a community and social exchange within a nexus of similar norms improved their overall social skills and attitude towards the module of quantitative methods. In comparison to the analysis that has been presented so far, examining the benefits of technology enhanced sessions on individual level generated more positive responses. The results from the examined sample were very similar the conclusions drawn in relevant work, confirming the development of skills through the implementation of practical assessments and extensive collaboration, as well as the importance of pedagogical socialisation towards the improvement of the overall learning process and construction of common knowledge though the sharing of experiences, thoughts and skills (Asare 2023, Thomas, 2021, Fernando & Marikar, 2017).

How would students improve TEL sessions:

The last part of the analysis was a chance to discuss with the participants about potential development and improvement of TEL sessions in quantitative methods. Although the assessment was primarily based on the respective sessions of the examined university and each programme of study, it provided valuable insight on the general attributes that can inform learning strategies in Higher Education. 9 out of 10 participants stressed the importance of real-world problem-solving activities and suggested the allocation of more

practice hours in the curriculums. Also, they proposed the addition of cross-disciplinary projects that can introduce students to the wider applicability of quantitative methods. Finally, further investment in a variety of software that would equip students with an important tool for learning but also with an employable asset for their future studies and placement in the occupational sector. Similar to what was observed in Lundahl's (2008) research, the participants of this project recommended the employment of CBL, CAL and CSCL sessions as a central component for the teaching of quantitative methods, as it is can successfully enhance the learning and development of statistical skills, as well as the acquisition of those skills that are transferable to the labour market (Eshet 2021).

Furthermore, another point of agreement that was observed amongst students with contrary evaluations about QM, was the attention that is required towards the individual learning needs of students and how these can be facilitated by an interactive nexus of communication, online material and tutorials, one-to-one sessions, and extensive feedback (Thomas, 2021). Finally, the participants evaluated the implementation of CBL, CAL and CSCL, as an effective educational practice to improve their understanding on quantitative research methods, participate in a safe environment and interact positively with a vital tool for the social sciences (Kolpashnikova & Bartolic, 2019).

Conclusions

Although the input from participants was more positive than expected, especially compared to the respective work on the topic, the benefits of CBL, CAL and CSCL were observed in the analysis, leading to the overall conclusion that students in social sciences currently present statistics and maths anxiety, TEL methods are helpful in addressing emotional, social and cognitive issues and that traditional teaching methods might not be as effective towards “learning and doing sociology” (Thomas, 2021). The participants’ responses and subsequent analysis suggest that TEL methods are beneficial for improving both the learning environment and the learning process, as well as promoting pedagogical socialisation through game-based activities. Thus, technology should be perceived as the total of developments and not just which innovation is more relevant at the time. Institutions should extend their involvement with technology to more than administrative and supportive purposes and fully exploit the theoretical and practical framework of technology in education.

Ultimately, the focus now should be on how to make active learning through technological means a pivotal point in learning and inform sociological methods accordingly, to produce skilled sociologists. Of course, it is always up to each scientist to choose their research methods, nevertheless the logic of quantification in social sciences is vital aspect for the field. Students tend to avoid quantitative methods because they are hard and the aim for institutions and teachers should be to make it easier for learners and contribute actively to their proper education.

References

Akintayo, N.O.T. *et al.* (2024) Evaluating the impact of educational technology on learning outcomes in the higher education sector: A systematic review, *Open Access Research Journal of Multidisciplinary Studies*, 7(2), pp. 052–072. https://doi.org/10.53022/oarjms.2024.7.2.0026.

Allen, P.J. and Baughman, F.D. (2016) Active Learning in Research Methods Classes Is Associated with Higher Knowledge and Confidence, Though not Evaluations or Satisfaction, *Frontiers in Psychology*, 7. https://doi.org/10.3389/fpsyg.2016.00279.

Apter, D.E. et al (2021). *Schools of Thought : Twenty-Five Years of Interpretive Social Science.* Princeton, NJ: Princeton University Press.

Asare, P.Y. (2023) Profiling teacher pedagogical behaviours in plummeting postgraduate students 'anxiety in statistics, *Cogent Education*, 10(1). https://doi.org 10.1080/2331186x.2023.2222656.

Blaikie, N. (2003) *Analyzing Quantitative Data.* London: SAGE Publications Ltd. Available at: https://doi.org/10.4135/9781849208604 (Accessed: 15 April 2024).

Bogdan, R. and Biklen, S.K. (2011) *Qualitative Research for Education: An Introduction to Theories and methods,* 5th ed. London, UK: Pearson.

Braun, V. and Clarke, V. (2021). *Thematic Analysis: A Practical Guide*. SAGE Publications.

Carver, T. (1982) *Marx's Social Theory*. Oxford University Press.

Celis, S., Quiroz, C. and Toro-Vidal, V. (2019) Do not interrupt students 'work: How teacher interactions influence Team's Problem-Solving capabilities, in *Research in mathematics education*, pp. 261–278. https://doi.org/10.1007/978-3-030-29215-7_14.

Chamberlain, J.M., Hillier, J. and Signoretta, P. (2015) Counting better? An examination of the impact of quantitative method teaching on statistical anxiety and confidence, *Active Learning in Higher Education*, 16(1), pp. 51–66. https://doi.org/10.1177/1469787414558983.

Chesnut, C.E., Hitchcock, J.H. and Onwuegbuzie, A.J. (2018) Using mixed methods to inform education policy research, *Complementary Research methods for Educational Leadership and Policy Studies*, pp. 307–324. https://doi.org/10.1007/978-3-319-93539-3_15.

Delve, L. and Limpaecher, A. (2023) Thematic Analysis vs. Interpretative Phenomenological Analysis in Qualitative Research, *Delve Tool*, 23 June. Available at: https://delvetool.com/ blog/interpretative-phenomenological-analysis-vs-thematic-analysis (Accessed: 14 March 2024).

Detlor, B. *et al.* (2012) Student perceptions of information literacy instruction: The importance of active learning, *Education for Information*, 29(2), pp. 147–161. https://doi.org/10.3233/efi-2012-0924.

Dietz, T.L. (2012) Predictors of success in Large Enrollment Introductory Courses: An examination of the impact of learning communities and virtual learning resources on student success in an introductory level Sociology course, *Teaching Sociology*, 30(1), p. 80. https://doi.org/10.2307/3211522.

Eshet, Y., Steinberger, P. and Grinautsky, K. (2021) Relationship between Statistics Anxiety and Academic Dishonesty: A Comparison between Learning Environments in Social Sciences, *Sustainability*, 13(3), p. 1564. https://doi.org/10.3390/su13031564.

Espeland, W.N. and Stevens, M.L. (2008) A sociology of quantification, *Archives Européennes De Sociologie/Archives Européennes De Sociologie*, 49(3), pp. 401–436. https://doi.org/10.1017/s0003975609000150.

Fernando, S.Y. and Marikar, F.M. (2017) Constructivist Teaching/Learning Theory and Participatory Teaching Methods, *Journal of Curriculum and Teaching*, 6(1), p. 110. https://doi.org/10.5430/jct.v6n1p110.

Halpern, R. (2016) Active Learning Works! Until it Doesn't: Measuring the Effectiveness of Activity-Based Learning Exercises on Information Anxiety, *Journal of Library & Information Services in Distance Learning*, 10(3–4), pp. 242–253. https://doi.org/10.1080/1533290x.2016.1219201.

Heotis, E. (2020) Phenomenological Research Methods: Extensions of Husserl and Heidegger, *International Journal of School and Cognitive Psychology, 7*(2).

Holder, S.K. (2016) *Sociology: Research Methods and Theories.*

Iuzva, L. (2017) Active learning methods at the faculty of sociology: the experience of the teacher, *Sociological Studies of Contemporary Society,* 38, pp. 108-114.

Kolpashnikova, K. and Bartolic, S. (2019) Digital divide in quantitative methods: The effects of computer-assisted instruction and students 'attitudes on knowledge acquisition, *Journal of Computer Assisted Learning*, 35(2), pp. 208–217. https://doi.org/10.1111/jcal.12322.

Kurniawan , D. and Wahyuningsih T. (2018) Analysis of Student Difficulties in Statistics Courses., *International Journal of Trends in Mathematics Education Research,* 1(1), pp. 53-55.

Lundahl, B.W. (2008) Teaching research methodology through active learning, *Journal of Teaching in Social Work*, 28(1–2), pp. 273–288. https://doi.org/10.1080/08841230802179373.

Miller, C.E. (2019) Leading digital transformation in higher education, in Ojan, Y and Huang, G. (eds.) *Technology Leadership for Innovation in Higher Education,* Advances in educational marketing, administration, and leadership book series, pp. 1–25. https://doi.org/10.4018/978-1-5225-7769-0.ch001.

Mireles, A. (2023) Blended Pedagogy in Social Statistics Courses: Prelecture Strategies for Encouraging Learning among First-Generation College Students, *Teaching Sociology*, 51(3), pp. 231–244. https://doi.org/10.1177/0092055x231170749.

Murtonen, M. *et al.* (2010) "Do I need research skills in working life?": University students 'motivation and difficulties in quantitative methods courses, *Higher Education*, 56(5), pp. 599–612. https://doi.org/10.1007/s10734-008-9113-9.

Murtonen, M. et al (2008) University Students 'Research Orientations: Do negative attitudes exist toward quantitative methods?, *Scandinavian Journal of Educational Research*, 49(3), pp. 263–280. https://doi.org/10.1080/00313830500109568.

Neubauer, B.E., Witkop, C.T. and Varpio, L. (2019) How phenomenology can help us learn from the experiences of others, *Perspectives on Medical Education*, 8(2), pp. 90–97. https://doi.org/10.1007/s40037-019-0509-2.

Nind, M. (2019) A new application for the concept of pedagogical content knowledge: teaching advanced social science research methods, *Oxford Review of Education*, 46(2), pp. 185–201. https://doi.org/10.1080/03054985.2019.1644996.

Oliveira, W. *et al.* (2022) Tailored gamification in education: A literature review and future agenda, *Education and Information Technologies*, 28(1), pp. 373–406. https://doi.org/10.1007/s10639-022-11122-4.

Pfeffer, C. A. and Rogalin, C. L. (2012) Three Strategies for Teaching Research Methods: A Case Study, *Teaching Sociology*, *40*(4), pp. 368–376. http://www.jstor.org/stable/41725520.

Phellas, C., Bloch, A., and Seale, C. (2011) Structured methods: interviews, questionnaires and observation, in Seale, C. (ed.), *Researching Society & Culture*, 3rd edn., SAGE Publications Ltd.

Ralston, K. (2020) Sociologists shouldn't have to study statistics: Epistemology and anxiety of statistics in sociology students, *Sociological Research Online*, 25(2), pp. 219–235.

Reza, M. *et al.* (2014) Equipping the Constructivist Researcher: The Combined use of Semi-Structured Interviews and Decision-Making maps, *The Electronic Journal of Business Research Methods*, 12(2), p. 87. https://academic-publishing.org/index.php/ejbrm/article/view/1318.

Robertson, L. (2018) Toward an epistemology of active learning in higher education and its promise, in Misseyanni, A., Lytras, M.D., Papadopoulou, P. and Marouli, C. (eds.) *Active learning strategies in Higher Education,* Emerald Publishing Limited*,* Leeds, pp. 17–44. https://doi.org/10.1108/978-1-78714-487-320181002

.Rubens, P. and Southard, S. (2020) Students 'technological difficulties in using Web-Based learning environments, in P. Rubens (ed) *Online Education*. 1st edn. Routledge. https://doi.org/10.2190/oegc11.

Savenye, W.C. and Robinson, R.S. (2005) Using qualitative research methods in higher education, *Journal of Computing in Higher Education*, 16(2), pp. 65–95. https://doi.org/10.1007/bf02961475.

Sirisilla, S. (2022) Qualitative Vs. Quantitative Research - A step-wise guide to conduct research, *Enago Academy*. 8 December. Available at: https://www.enago.com/academy/qualitative-vs-quantitative-research/. (Accessed 23 May 2024).

Skott, B., P. (2013) *Active learning exercises for research methods in social sciences.* Thousand Oaks, CA: SAGE.

Sokolosva, V., Cobanovic, K., and Nikolic-Dorices, E. (2010) Position and Perspective of Statistics in Sociology, in Reading, C. *Data and context in statistics education: Towards an evident based society.* Proceedings of the Eighth International Conference on Teaching Statistics (ICOTS), Slovenia.

Stockemer, D. (2019) *Quantitative Methods for the Social Sciences: A Practical Introduction with Examples in SPSS and Stata.* Cham: Springer International Publishing.

Talan, T. (2021) The Effect of Computer-Supported Collaborative Learning on Academic Achievement: A Meta-Analysis study, *International Journal of Education in Mathematics, Science and Technology :*, 9(3), pp. 426–448. https://doi.org/10.46328/ijemst.1243.

Thomas, A.K. (2021). *A Grounded Theory Inquiry into the Pedagogical Socialisation of Graduate Students within Graduate Quantitative Methods Courses.* Faculty of the Morgridge College of Education.

Whitt, E.J. and Kuh, G.D. (1989) Qualitative Methods in Higher Education Research: A Team Approach to multiple site Investigation, *ASHE Annual Meeting Paper*. https://files.eric.ed.gov/fulltext/ED313981.pdf.

Williams, M. and Payne, G. (2011) *Teaching quantitative methods: Getting the Basics Right*. SAGE.