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Technology-Enhanced Learning: Towards Providing Supports for PhD Students and Researchers in Higher Education.

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Handbook of Research on Scholarly Publishing and Research Methods

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Chapter 12

Technology–Enhanced Learning: Towards Providing Supports for PhD Students and Researchers in Higher Education

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ABSTRACT

There are many elements to an individual’s life. Each individual engages in a variety of different activities which all require different types or forms of supports. Through family, friends, and colleagues, supports are available for many of the activities in which we engage. But, for students conducting research, specific types of support are necessary that can only be provided by supervisors and peers. This chapter reviews the supports necessary to learn how to effectively undertake research and how these supports could satisfactorily be provided through an e-learning portal or an e-learning platform. An e-learning module could be used to facilitate collaboration amongst student learners and researchers who share similar research interests. Students should be encouraged to develop a community of practice with fellow researchers as this relationship could provide beneficial peer support for as long as their research interests evolve and endure.

INTRODUCTION

This chapter investigates some of the issues which researchers encounter when performing their research and suggests that an e-learning module would assist researchers in overcoming these issues, “with the worldwide spread of journals in educational research, such technology-enhanced

research has received much attention since the turn of the century” (Hwang & Tsai, 2011, p. 65). A Technology Enhanced Learning (TEL) or an e-learning module on research methods and statistical analysis is envisaged not as a replacement for existing structures to assist researchers, but as an enhancing technological solution to augment existing approaches through blended learning.

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Technology has enhanced research through the ease of access to electronic journals and other citable electronic media. The use of word processing applications and referencing packages has made the writing up of research findings more efficient. The use of statistical analysis applications, spreadsheets, and database packages, has streamlined the process of analysing data, and the production of graphs and charts to illustrate the findings. The use of graphs and charts has greatly improved the readability and understanding of research outcomes. Communications between co-authors, editors and publishers through e-mail has greatly improved the flow and process of publishing academic research. Online submission of electronic papers has further enhanced the publishing process.

Technology enhanced learning (TEL) refers to the support of teaching and learning through the use of technology and can be used synonymously with e-learning, technology enhanced research has the possibility of supporting researchers and perhaps improving the quality of research. An e-learning module is stored in a predefined location on an e-learning platform and is dedicated to a particular subject area. Students are provided with user names and passwords to access and contribute to this module. Because the e-learning module is online students can access this module at any time from any place providing they have the appropriate computer equipment and broadband access.

While collaborating on papers and writing chapters of books, realisation dawned that a greater knowledge and use of research methods and statistical analysis was necessary to improve the quality of research and meet the requirements of peer reviewers. "Improving the quality of the student learning experience is a key issue in the higher education sector" (Dermo, 2009, p. 203). Power, Miles, Peruzzi, and Voerman (2011), and Parkinson (2009), suggest students can benefit from peer-to-peer mentoring in higher education. Hence, this book chapter proposes that an e-learning module on research methods and sta-

tistical analysis which encourages peer-to-peer mentoring could effectively support students and researchers and encourage peer-to-peer mentoring.

"Due to a lack of formal research training and experience, students can find completing research projects a daunting task. This, coupled with a fear of statistics, can culminate in quite an overwhelming experience for many students" (Chen, 2012, p. 1). When one commences study for a PhD (Doctor of Philosophy), generally a BSc (Bachelor of Science) and MSc (Master of Science) have already been acquired to a high level of academic achievement, conferred with a First or 2.1 Honours. Research methods and statistical analysis may not necessarily have been included in the subjects covered in the discipline undertaken or possibly some time has passed and a refresher course is required to update skills. Therefore there is perhaps a need for researchers to familiarise themselves with the correct application of research methods and statistical analysis techniques to their specific research area. Some researchers will have a good understanding of research methods and instinctively know which method or combination of methods to apply to specific research, while other researchers may need guidance and support in the correct application of research methods and statistical analysis for specific research undertakings.

Not all researchers will need an extensive knowledge of statistical analysis to present their research, but an awareness of the different methodologies available for analysing research will enable researchers to select the most appropriate methodology to do justice to their work. The objective of such an e-learning module is to enable researchers to keep up to date with changes in approach in the field of statistical analysis and satisfy personal changing needs as each individual researchers work evolves with time. The term e-learning refers to various forms of teaching and learning which are facilitated through the use of technology.

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In addition, should a community of practice evolve this may encourage researchers to communicate with other researchers to discuss the most appropriate statistical analysis methods to employ in specific circumstances. “A community thrives not only on its resources, but also on the relationships among its members” (Cheak, Angehrn, & Sloep, 2006, p. 123). Such a community of practice would facilitate students by providing a potential environment to support each other’s research efforts. A community of practice is formed when a group of people are drawn together through shared interests or goals. Generally, the members of the community of practice benefit from the sharing of knowledge and experience, and peer support (Dawson, 2010; Sitthiworachart & Joy, 2008). The use of discussion boards are a good medium for facilitating asynchronous online communication between members of the community of practice. E-mail is another example of an asynchronous communication affordance (Smyth, 2011). Web conferencing (Scott, Castañeda, Quick, & Linney, 2009; Smyth, 2011) can be used to facilitate synchronous online communication between members. Hierarchical and peer relationships when used together can promote a rich learning environment (Christiansen & Bell, 2010). An e-learning module would enable researchers to link up with others with similar research interests and perhaps collaborate for writing: journal articles, conference presentations, chapters of books, books or reports.

The benefits to be achieved by providing researchers with an e-learning module would include: storage of notes, learning activities, and web links, in the one location, the opportunity to form a community of practice, the chance to collaborate with other researchers, and more than likely benefit from the support and guidance of peers.

The background section is broken down into a number of sub-sections: data types; quantitative and qualitative data types; and statistical analysis. This is followed by a section on e-learning module and blended learning which includes sub-sections

as follows: community of practice and online collaboration; improving the quality of research; and personalised e-learning. Issues, controversies and problems encountered by researchers are discussed and some solutions and recommendations are made as to how these can be resolved by using an e-learning module. Future research directions are reviewed and the chapter is concluded.

BACKGROUND

The term ‘researcher’ will be used as a generic term in this chapter to represent any or all of the following who are involved in research: degree, post graduate, masters and PhD students, research fellows, academic researchers, and business researchers.

Researchers’ interests tend to evolve as a result of unforeseen contributory factors, for example: funding opportunities, enterprise opportunities, attendance at seminars, research findings, or through the recognition of a specific hypothesis which merits further inquiry. Such influences can force researchers to select alternative research methods and statistical analysis techniques to the ones which they initially envisioned to be most appropriate to their own specific research interests. An e-learning module would enable students to explore different analytical approaches, as the need arises, to satisfy their research requirements as they change with time.

An e-learning module can be used for the: dissemination of course notes; administration of the course; dissemination of assignments; submission of assignments; use of asynchronous and/or synchronous discussions; enabling of students to peer review the submission of other students.

Asynchronous discussions refer to discussions which do not take place in real time. Each subscriber has the opportunity to research and present their opinion to a discussion board for peers to review at some later time. Asynchronous discussions enable subscribers to plan, research,

structure, and reflect on their submission before they submit it to the forum for peers to review. Synchronous discussions refer to discussions which take place in real time. Subscribers respond to other subscribers' suggestions and comments without the opportunity to plan, research, structure, and reflect upon their submission to the forum. There are educational merits to both forms of communication.

An e-learning module for researchers would contain educational resources on research methods and statistical analysis to suit a broad range of requirements. Some researchers may already have some knowledge of research methods and statistical analysis while others may be totally new to conducting research. A range of learning activities should be provided in the e-learning module grouped into different levels of difficulty. Therefore enabling researchers to select the activities which best suit their existing level of knowledge and specific requirements at any point in time and work through the resources at their own pace. Skinner (1981) recommends that participants be presented with an alternative sequence of simpler tasks to perform if an initial task is too complex to grasp. By providing tasks aimed at different levels of competence, researchers at all levels should be able to identify and benefit from the use of appropriate e-learning activities.

Competent use of research methods and statistical analysis is paramount to the skill set of researchers. Peer reviewers will soon spot if the methods applied are unsuitable or ill used. Salmon (2009) mentions that statistical analysis is one way of observing trends but statistical analysis methods available for virtual worlds are neither well co-ordinated nor reliable. This statement supports the argument that researchers require a more comprehensive knowledge of statistical analysis methods and techniques and appropriate application to research in order to correctly compile and present findings to ensure their reliability when discussing virtual environments and other research areas.

DATA TYPES

There are two main types of data: quantitative and qualitative. Researchers need to be familiar with both types to ensure that they approach their study with an informed mind to enable them to apply the most appropriate type to test their hypothesis. The combined use of quantitative and qualitative data types facilitates triangulation of data sources enabling researchers to substantiate findings by correlating the hard facts of the numerical quantitative data with the soft more human side of qualitative analysis.

Quantitative and Qualitative Data Types

Quantitative methods of data collection include the collection of numerical data and participants' responses to closed ended questions. Closed ended questions can lead participants to concentrate on specific areas. Qualitative methods of data collection include the use of open ended questions which enable participants to give their views and opinions on issues without any influence from the researcher. Qualitative methods enable researchers to gather personal human experiences relevant to the hypotheses. This gathered data should contain unbiased views on research questions. The findings from both methods can then be correlated to see if they substantiate each other.

Quantitative analysis uses techniques including ratios to analyse numerical data that represent measurable characteristics in order to make sense of available information. Quantitative research tends to be framed in numbers or closed-ended questions, which do not encourage or facilitate the respondent to add any extra information which they feel is relevant. Hence, the opportunity to collect some very worthwhile feedback can be lost. More importantly, the findings of such research could be biased by the researchers own views. Because the researcher may unintentionally set specific boundaries on the information harvested,

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by leaving respondents no opportunity to divulge other thoughts on the subject. Such data collection methods could influence the conclusions derived from the data and effectively make the research useless.

Quantitative analysis alone produces insufficient in depth knowledge to do justice to the majority of research questions involving complex human experiences. Qualitative analysis is conducted by using techniques such as interviewing and observing participants and the collection of both oral and written communication from participants which can provide improved understanding of complex human experiences. A key consideration is how to improve the quality of researchers use of qualitative research in higher education (Davidson & Jacobs, 2008). Due to the diverse spectrum of influences that affect human lives, researchers require a variety of methodologies and techniques in order to achieve a deeper understanding of human experiences in order to generate useful knowledge as suggested by Fossey, Harvey, McDermott and Davidson (2002). Chesebro and Borisoff (2007) suggests that grounded theory emerges from data from the ground up, qualitative research deduces meaning from words and quantitative research commence with a theory to examine. Creswell (2009) suggests that qualitative analysis is framed using words and open-ended questions, whereas a mixed method approach incorporates elements of both quantitative and qualitative analysis.

Brannen (2005) recommends from empirical evidence that there is strong support for combining both qualitative and quantitative data types in research. Researchers could perhaps benefit from seeing a variety of research methods and the collection of different data types applied to different case studies. An e-learning module which also encompasses standard e-learning functionality such as discussion boards and chat facilities would enable students to discuss with peers their thoughts on the various approaches. Discussion and reflection are very important as-

pects of the learning experience of students and the investigative work conducted by researchers. The suggested module would enable students and researchers to engage with the e-learning resources and take time to reflect on the information which they have gathered. Subsequently, researchers could discuss their thoughts with peers using the discussion boards, or face to face discussions, to turn this information into knowledge. Such activity would assist researchers in using quantitative and qualitative methods in the most effective way. Hoyles, Küchemann, Healy and Yang (2005) recommend that corroborating evidence gathered through quantitative and qualitative data types used in research methods aids interpretation and contextualization.

Statistical Analysis

The range of statistical methods and techniques is vast and researchers could benefit from an e-learning module that would assist them in identifying the most suitable techniques to apply to their studies. An e-learning module would accommodate researchers' requirements as Murphy (2008) suggests researchers approaches change and statistical analytical requirements evolve throughout the course of their studies. Some statistical analysis techniques in regular use by researchers include: Analysis of variance (ANOVA); Chi-squared test, Correlations, Regression analysis, and Student's t-test.

E-LEARNING MODULE AND BLENDED LEARNING

An electronic learning (e-learning) module facilitates ubiquitous access to learning resources providing the student has broadband connectivity and the necessary computer equipment. Blended learning is where electronic learning resources are used to augment/enhance traditional teach-

ing methods. Akyol and Garrison (2011) suggest high levels of cognition and learning outcomes can be achieved using blended learning. The proposed e-learning module could be used by educators to augment structures already in place to support researchers. Technology enhanced learning (TEL) refers to the support of teaching and learning through the use of technology and can be used synonymously with e-learning, technology enhanced research has the possibility of supporting researchers and perhaps improving the quality of research.

Despite the fact that the merits of technology enhanced learning have yet to be proven teachers are still encouraged to undergo training in the pedagogic use of technology (Jung & Latchem, 2011). Lecturers and teachers are continuously being encouraged to participate in e-learning summer schools, teaching qualifications which involve the use of Information Communication Technology (ICT), and research which also involves a reasonable knowledge of technology. Increasingly interactive whiteboards are being introduced to the classrooms at various different levels of the educational environment. Technology in learning is not going away any time soon, so educators may engage with the use of technology in educating their students, leave technology out of their pedagogic approach if it is deemed unhelpful or continue using technology to enhance the learning experience if they deem it beneficial. The minds of educators need to be informed of the pedagogic benefits which can be realised by using technology in their teaching methodologies, if educators are still not satisfied that technology can have a positive impact on the learning experience then they possibly have the choice of removing the use of technology from the classroom. Some departments and schools embrace the use of technology and encourage educators to create an online presence, others leave it up to the individual educators to decide which teaching methods they wish to employ.

Community of Practice and Online Collaboration

An e-learning module would enable researchers to collaborate with other researchers in order to identify the most appropriate analytical methods to use to evaluate and portray specific data in the most appropriate format. Students online collaboration facilitates a social environment “that promotes better learning” (Doering, Pereira, & Kuechler, 2012, p. 5). Collaboration refers to people working together as a team on a particular project or working together online to achieve a shared goal. “Good interdisciplinary research requires genuine team work and appreciation of the different skills contributed by the partners involved” (Bowman, 2007, p. 361). Unwin (2007) discusses the importance of good communication skills, continual interaction with peers, and “acting with mutual respect and understanding” (Unwin, 2007, p. 355). These interpersonal skills are paramount to the success of a community of practice. Figure 1 illustrates how a community of practice could evolve through the use of an e-learning module.

In addition, such an e-learning module would provide each researcher with access to a well informed community of practice to call upon for support as their research requirements demand. The ubiquitous nature of such a module would have the possibility of enhancing learning experience of researchers. This module could also facilitate researcher collaboration across various disciplines. Such a module could be created to augment and enhance the classroom experience of students as a form of blended learning. During the classroom sessions, students could be encouraged to engage with, and make effective use of the e-learning features. In addition, students should be urged to form a community of practice through the discussion boards and the chat facility. The use of discussion boards in the Masters in Information Systems for Managers (MISM) course (Oscail, 2007), encouraged the students to form a community of practice.

Figure 1. Community of practice



The community of practice enhanced the learning experience of the students who participated and contributed to the asynchronous and synchronous discussions. Some of the most frequent contributors to the online discussions achieved the most satisfaction from the course. When the Masters in Information Systems for Managers (Oscail, 2007) course ended so did the discussions. Such an e-learning module could be used by students/researchers to review methods and techniques, and to participate in the community of practice with other researchers to discuss further research projects and to disseminate findings.

Rovai (2002) discusses the importance of establishing a sense of community and hence reducing feelings of isolation. Due to the nature of research, each individual travels a unique path of discovery. This indeed can be a lonely, isolated process. Being afforded the opportunity to engage with other researchers as the need arises to discuss progress, or possibly more importantly: lack of progress, seek advice or generally just to get thoughts straightened out, could help alleviate the feelings of isolation. Moderato (2006) observed that a negative effect of isolation is the lack of exchange of ideas with other researchers. Such an e-learning module would facilitate the exchange

of ideas with other researchers. In addition, the theoretical course content in the statistical analysis part of the module could be dipped in an out of as the researchers interests evolve and requirements change.

Vygotsky (2004) in a paper “Imagination and Creativity in Childhood” stated that “Nothing important in life is achieved without a great deal of emotion” (Vygotsky, 2004, p. 55). A PhD qualification is a prestigious achievement in life, a great deal of emotion can be felt by researchers while striving to achieve this goal. An e-learning module such as the one proposed in this chapter, would enable researchers the opportunity to support other researchers going through the research process, as part of a community of researchers the burden of emotional frustrations could be shared with others. Resnick (1987) recommends that researchers may also avail of the opportunity to augment their work by using cognitive tools devised by others. An e-learning module would afford researchers the opportunity to review and discuss the relevance of using tools devised by others to enhance their own research approach. Ribot (1901) recommends that researchers can also augment their work by reviewing anonymous inventions. Researchers need to review the work

of others, even if the contributions are anonymous to create a state of the art literature review and position their work in the research area with respect to the achievements and discoveries of others. According to Cole et al. (1978) through Vygotsky's concept of Zone of Proximal Development, researchers would benefit through contact with more capable others or peers for guidance on the most appropriate methodology to use for specific research interests. Researchers using the module could be encouraged to leave contact details with appropriate statistical methods that they have applied in their research, so that other researchers contemplating the use these methods can get in contact. Thus, inexperienced researchers would have the opportunity to discuss their research methods and analytical approaches with others who have been through the PhD process and perhaps benefit from the shared experiences of more capable others.

Piaget (2008) suggested that reasoning develops as a result of trying to argue one's own views on a subject. Participation in such an online community of practice would allow researchers the opportunity to discuss/argue various viewpoints on theories, research methods and techniques used in the research process, in order to establish the approach most suited to the research which they are undertaking. All of the above supported arguments suggest that such an e-learning module would effectively improve the overall quality of PhD research and research in general.

IMPROVING THE QUALITY OF RESEARCH

An e-learning module on research methods and statistical analysis could perhaps improve the quality of the research and also enable researchers to communicate with each other by forming a community of practice to share knowledge and provide support to each other. The content for this module would contain all the theory, methodologies and

techniques used in research methods and statistical analysis currently available for researchers to use when planning and analysing their research. Along with appropriate questions, solutions and applied examples to assist researchers in identifying the most appropriate research methods and statistical analysis techniques to apply to their specific research questions. This module would assist researchers in identifying learning content best suited to their needs. Therefore, the learning outcomes to be achieved through engagement with this module will be tailored to the specific needs of each individual researcher's requirements.

In essence, the objective of the proposed e-learning module is to: enhance the learning experience of researchers, improve their research outputs and ensure the peer supports are in place to assist them in completing the process.

Researchers could initially attend introductory courses on research methods and statistical analysis enhanced by proposed e-learning module. Involvement in the module should be encouraged. Researchers can be motivated to engage with each other to create an online community of practice within this module. At the completion of the introductory courses researchers could still have access to this e-learning module to use to refresh their skills as necessary or to delve into other methodologies and techniques as the need arises due to changing research needs. But, most importantly of all, to communicate with other researchers through the community of practice, to benefit from the peer review and help and advice which fellow researchers are willing to share.

Personalised E-Learning

Kalyuga and Sweller (2005) found that learner-adapted formats in e-learning environments proved to be more effective than non-adapted formats for changing levels of learner expertise in a domain. It would be interesting to test whether the provision of learner-adapted formats in a module for researchers would improve their expertise over

a module which did not adapt to learners. This approach is based in the area of personalised e-learning. The creation of personalised e-learning formats is a complex process which is not easily achieved by non-technical educators. Dagger, Conlan and Wade (2003) recommend the use of a personalised e-learning module would effectively enable reusability, accessibility, interoperability and durability of peer reviewed learning resources. Access to such a personalised e-learning module would ensure that researchers have access to good quality learning content tailored to support their specific research requirements at all times.

Duncan-Howell (2010) in a paper “Teachers making connections: Online communities as a source of professional learning” suggests “Online communities may present a source of continuous professional development for teachers as they are able to deliver authentic and personalised opportunities for learning” (Duncan-Howell, 2010, p. 324). Online communities do afford learners the opportunity for personalised support from peers. The proposed e-learning module would provide researchers and PhD students with personalised support from their peers, in a timely fashion, which is relevant to their current research undertakings.

ISSUES, CONTROVERSIES, AND PROBLEMS ENCOUNTERED BY RESEARCHERS

Issues

A researcher may seek advice from the online community of practice and be accidentally led astray by a peer. Alternatively, a member of a collaborative team may misinterpret their role within the team and produce work which is outside the scope of the project (Donnelly & O'Rourke, 2007). An exemplary guide on the side would be necessary to ensure that questions posed by researchers to their peers were correctly answered, that each member understood the scope of collaborative

projects, and that all contributions were from good quality peer reviewed resources i.e. journal papers, books, book chapters and lecture notes. Edwards, Perry and Janzen (2011) suggest there is a need for strong, positive educators to affirm learners personal worth online and in the classroom. Educators can have an enormous influence on the learning experience of students online and in the classroom; some educators form a better rapport with students than others

A researcher may be aware of the research approach which they believe to be the most appropriate to apply to a specific hypothesis but would like assurance that this is the most appropriate method to apply. A discussion with peers on the merits of the intended approach could help clarify the approach and improve the quality of the research output. This module would also assist researchers who are uncertain of which research method to apply and the type of statistical analysis to use for a specific research question to seek guidance from peers. The guide on the side would monitor the advice to ensure the researcher in need is receiving good advice, discuss online if necessary, so all the other researchers can benefit from the discussion.

The time of lead researchers and PhD supervisors is a valuable asset as they have many and varied responsibilities including for example: Chair of a Board, Member of a Committee, Head of Department, Leading various research projects or lecturing commitments. Therefore, the use of an e-learning module would facilitate the peer review of research contributions before the lead researcher or supervisor need be consulted for guidance.

Asynchronous online discussions can be facilitated through the use of a discussion board. Discussion boards are the ideal tool to use to submit definitions, reviews, figures, tables and citations relevant to various topics to share with fellow students. The use of discussion boards gives students the opportunity to reflect on the submissions of others, conduct research of their own and then post at their leisure when they felt

that they had something relevant and worthwhile to contribute. Akyol and Garrison (2011) suggest asynchronous discussions have generated interest amongst educators with respect to deep and meaningful learning. From personal experience of using asynchronous discussions to explore various topics the author's opinion is that educators' interest in further exploring the use of asynchronous discussions in education is justified.

Synchronous discussions can take place through the use of a chat facility. From experience the chat facility for the purpose of conducting synchronous discussions was not a great success. Students participated by typing their contribution to an online conversation. This medium of communication suits some students but not others. Speed typists can contribute very quickly and keep up with the typed conversation. Student participants who were not speed typists find that it takes them so long to type a response that by the time they go to post their contribution to the conversation, the topic of the conversation has moved on leaving their contribution out of synch with the current flow of the online conversation. The synchronous discussion would be better conducted through web conferencing which would enable each student participating in the discussion equal opportunity to contribute to the discussion. Bower, Hedberg and Kuswara (2010) successfully used web-conferencing environments to enable students engage in collaborative design. Dolan, O'Connor, Mullally and Jennings (2004) conducted a study on synchronous e-learning and found "the outcomes were deemed to be very positive" (Dolan et al., 2004, p. 1).

When researchers in the Knowledge and Data Engineering Group (KDEG, 2013), in the School of Computer Science and Statistics, Trinity College Dublin were involved in the GRAPPLE FP7 STREP Funded Project (GRAPPLE, 2008), web conferencing was used to discuss evaluation guidelines (Steiner et al., 2010), training approach (Glahn, Steiner, De Bra, Docq, & O'Donnell, 2010), final evaluation (Glahn et al., 2011) and

various other issues which needed to be discussed. The participants in the GRAPPLE project were based in various European universities (GRAPPLE, 2008). The use of web conferencing in this instance reduced: researchers time spent on attending conferences, budgetary expenses, inconvenience to lifestyle, and undue damage to the environment due to travel induced air pollution.

Controversies

Netiquette must be observed at all times. In the case of researchers disagreeing on the appropriate use of techniques, respect must be shown for peers and all arguments must be supported by relevant citations and links to the cited sources. Should researchers disagree on the most appropriate research method to apply to specific research questions, the relevant supervisor(s) or lead researcher's opinion should be sought. Resolution paths may be required to deal with some controversies, for example, round table discussions with an appointed chair to review research positions and directions which may be justifiably challenged.

Problems

From experience using an e-learning module to support students, some students made regular and relevant contributions to the discussion board while others did not personally contribute but regularly followed the comments and work submitted by others. Akyol and Garrison (2011) comment that students were of the opinion that in order for the process to work all parties should contribute equally. Some type of encouragement is required to get all students to contribute to the forum to make it a success. The approach to resolving this issue in both the Masters in Information Systems for Managers (Oscail, 2007) and the Post Graduate Diploma in Business Information Systems (DIT, 2007) was to allocate marks for student contributions to the discussion board as part of the continuous assessment mark. The marking

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scheme for the student contributions was based on: the relevance of the contributions made and that the contributions were supported by citations from peer reviewed sources.

The success of an e-learning module to support researchers would be dependent on a number of factors such as the: researchers' motivation, supervisors' motivation, and the impact of publications resulting from the researchers' engagement with the e-learning module and so forth. The chosen discipline of each researcher/supervisor will also influence the dissemination rate, citation rate, and the impact factor. Some research areas may only attract the attention of a very small specialised niche group, which will duly affect the citation level and hence the impact factor, though the researcher may be very highly motivated.

"A scientifically written article comprises a reference section at the end where all the references mentioned in the document are cited serially, and each reference is a citation. A citation count is the frequency of an article cited by other articles" (Nigam & Nigam, 2012, p. 511). PhD students and researchers require an awareness of citations counts and their values to enable them target appropriate publications with their research. "Citation counts are often interpreted as proxies for the scientific influence of papers, journals, scholars, and institutions. However, a rigorous and scientifically grounded methodology for a correct use of citation counts is still missing" (Radicchi & Castellano, 2012, p. 1).

Hassad (2010) on discussing "Doctoral education (PhD) in the USA" (Hassad, 2010, p. 1), concludes "it may be an opportune time to explore adopting a PhD education model that is emerging in the European system, and which requires students to produce published peer-reviewed articles instead of (or in addition to) the dissertation" (Hassad, 2010, p. 4). Researchers can realise invaluable feedback from the peer review process. The peer review of many researchers in the same discipline as a PhD student can broaden the student's outlook and improve their approach and

academic writing style. Hassad (2010) suggests the model for PhD education which is emerging in the European system would add "another layer of accountability (and quality control) to the process, which can facilitate improved faculty support, and result in better prepared graduates" (Hassad, 2010, p. 4). For PhD students and researchers to know which journals, conferences, and publishing organisations to target with their research output, they would require knowledge of how the publishing process, citation counts, and how the Journal impact factor system works.

Lokker et al. (2012) cites both Garfield (Garfield, 2006) and Thompson Reuters Institute of Scientific Information (ISI, 2012), in the explanation of how Journal impact factors (JIFs) (Garfield, 2006) are calculated in all journals indexed by Thompson Reuters Institute of Scientific Information (ISI) (ISI, 2012), in the following quote on how to calculate JIFs. "Journal impact factors (JIFs) are calculated as the number of times articles in a journal published over a two-year period (e.g., 2005-2006) are cited in all journals indexed by Thompson Reuters Institute of Scientific Information (ISI) during the following year (e.g., 2007), divided by the total number of substantive articles and reviews published in that journal in the first two years (e.g., 2005-2006)" (Lokker et al., 2012, p. 28). Lokker et al. (2012) in the same paper suggests "Ultimately, it would be desirable to use a more robust and less controversial reference standard than JIF, which is based solely on citation counts of a somewhat arbitrary set of articles within journals over a fixed period" (Lokker et al., 2012, p. 32). Ideally, it would be nice to gauge papers by a less controversial reference standard, but this is one of the standards currently used to rate the impact factor of papers.

The h-index is another method in use "An h-index of 20 means that the scientist has published twenty papers that each had at least twenty citations" (Bador & Lafouge, 2011, p. 110). Another ranking method for papers is based on download counts "Journal of Vision (JOV) recently began

publishing download counts for every published article. The journal also ranks the top 20 articles by download” (Nigam & Nigam, 2012, p. 512). A combination of the above methods for ranking the impact of papers could be used to determine the success of the e-learning module for researchers. In the meantime, Tous et al. (2011) suggests “Because citation analysis has become a critical component in scholarly impact factor calculation, and considering the relevance of this metric within the scholarly publishing value chain, we defend that the relevance of providing a reliable solution justifies the effort of introducing technological changes within the publishing lifecycle” (Tous et al., 2011, p. 33).

Granić and Ćukušić (2011) suggest that the poor design of e-learning systems are one of the contributory factors to the slow uptake of e-learning. Another is the fear of appearing unprofessional (O’Donnell, 2008) or incompetent should the technology fail. Lack of time to engage with e-learning training and to create e-learning modules (O’Donnell, 2008) is another reason why educators do not engage with e-learning. The creation of e-learning modules takes considerable expertise (Thompson, Jeffries, & Topping, 2010). Above are just some of the reasons why educators do not employ the use of e-learning modules.

SOLUTIONS AND RECOMMENDATIONS

An exemplary, strong and positive guide on the side familiar with research methods and statistical analysis should be available to oversee the use of the e-learning module for researchers to ensure the methods and techniques are correctly applied. The guide on the side would be responsible for ensuring that netiquette is observed at all times by researchers using the module.

Identifying suitable units of learning to present to students is a skill or problem solving process which educators continuously strive to improve.

By providing researchers with a range of units of learning to facilitate self directed learning this would transfer the problem solving process to the researcher who then has the responsibility of identifying the most appropriate units of learning to study by themselves and apply to their research. This module would afford learners the opportunity to participate in different learning experiences based around a single concept in an attempt to broaden their knowledge of research methods and deepen their understanding of underlying concepts.

Examples of various different approaches to conducting research could be provided to enable students to obtain a better understanding of the complete research process from different perspectives. A comprehensive understanding of the research process and how and where to get published would assist students who are starting out on the path of discovery. The concepts depicted in the following figures are basic starting points; other concepts can be added to the various sections of the e-learning module at any stage. The concepts listed in the following figures are not exhaustive. Figure 2 portrays a simple example of how a researcher would approach testing a hypothesis through to dissemination of research findings.

Researchers would review various different approaches in order to identify the approach best suited to their particular research requirements. Researchers could use the e-learning module to discuss the different approaches with their peers through asynchronous or synchronous discussion to assist them in identifying the most appropriate approach to use for a particular type of research. The target media for dissemination of research will dictate: the rigour of analysis required, the referencing style to be used, and the preferred word processing formats.

Figure 3 outlines a selection of learning resources suitable for use by a researcher when commencing testing a hypothesis. Initially, the researcher would be led through a scenario outlining how to conduct a state of the art literary review.

Figure 2. Testing a hypothesis through to dissemination of findings

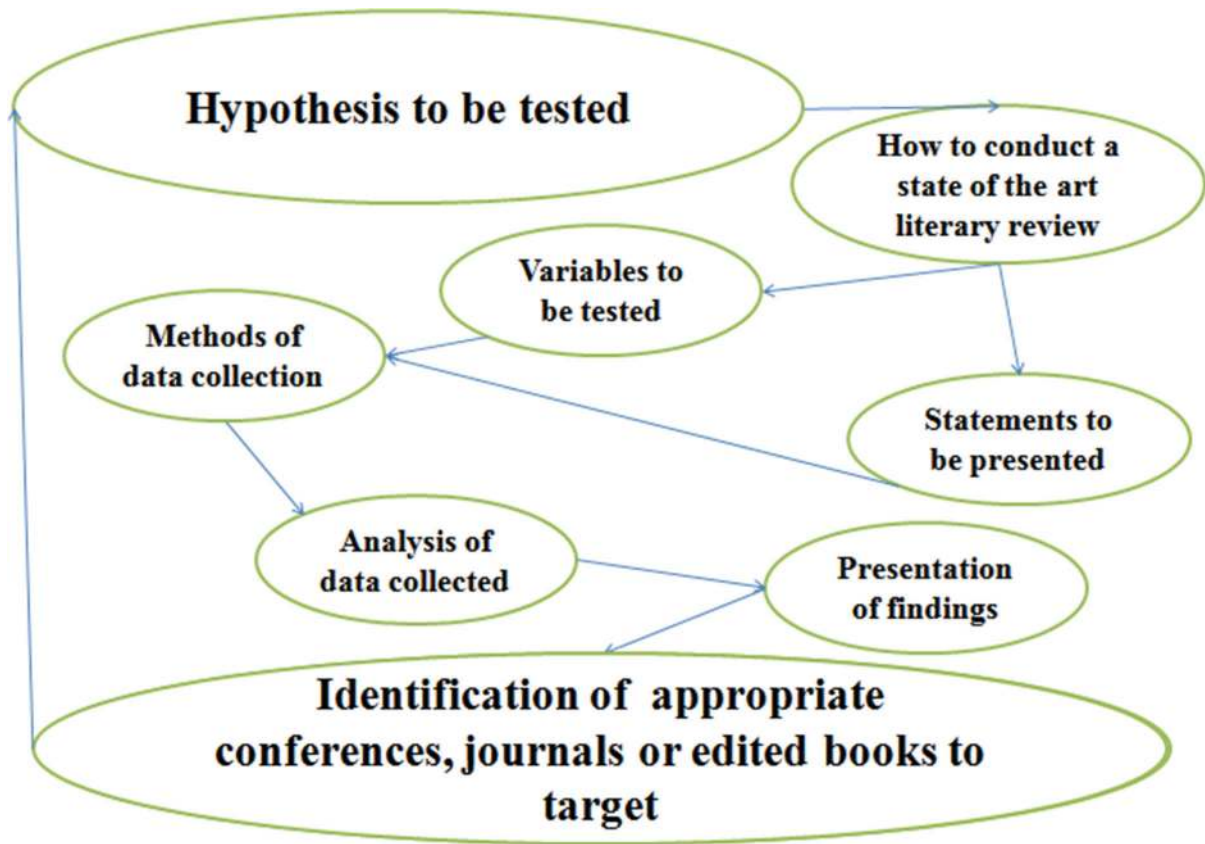


Figure 3. Resources to review

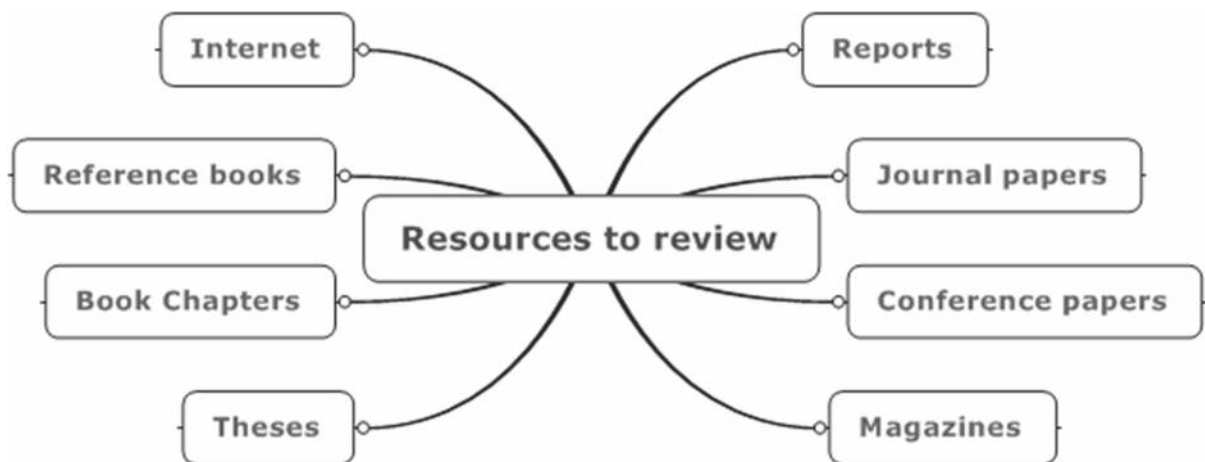
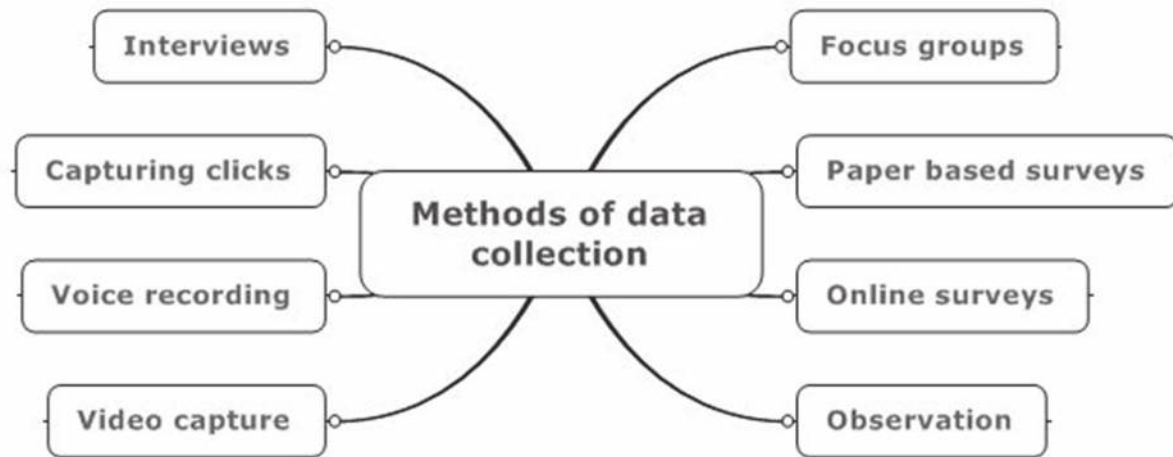


Figure 4. Methods of data collection



From the state of the art survey conducted the researcher would identify a set of variable to be tested to obtain quantitative data, and statements/questions to be presented to participants to obtain qualitative data to analyse. Once the researcher has identified variables and statements to be tested, the most appropriate research methodology must be applied. The students should then consider the research methods options available for collecting data, as outlined in Figure 4.

Research ethical clearance must be sought and granted before commencement of data collection, regardless of the methods of data collection selected. Guidance on how to apply for research ethical clearance should be provided for students within the e-learning module. Templates to apply for research ethical clearance should be made available and updated as the need arises. Samples of applications for research ethical clearance which have previously been granted should be available; to assist researchers and PhD students in the process of obtaining research ethical clearance.

The researcher then has to decide on the format of the data to be collected. The researcher has to consider in advance how they are going to analyse the collected data. The data can be collected in numerous different formats as indicated in Figure 5.

Options to consider when performing the analysis of data collected would be provided as per Figure 6. These options would be expanded upon within the e-learning module, to enable the PhD students and researchers read up on the various options available and select the option(s) most suited to the specific research they are currently pursuing.

In the analysis of data collected section, the e-learning module would enable researchers to select the most appropriate methods of data analysis relevant to the type and volume of data collected.

The presentation of findings may well depend on the discipline and where the research is to be published. Some publishers prefer black and white submission, for example, reference books, whereas, posters are generally in colour. The presentation of the findings will depend on the type of publication targeted. The e-learning module would supply information relevant to the type of publication targeted, for example:

- Summarised version for a poster
- 4,000 words for a journal article
- 8,000 – 10,000 words for a chapter of a book

Figure 5. Format for data collection

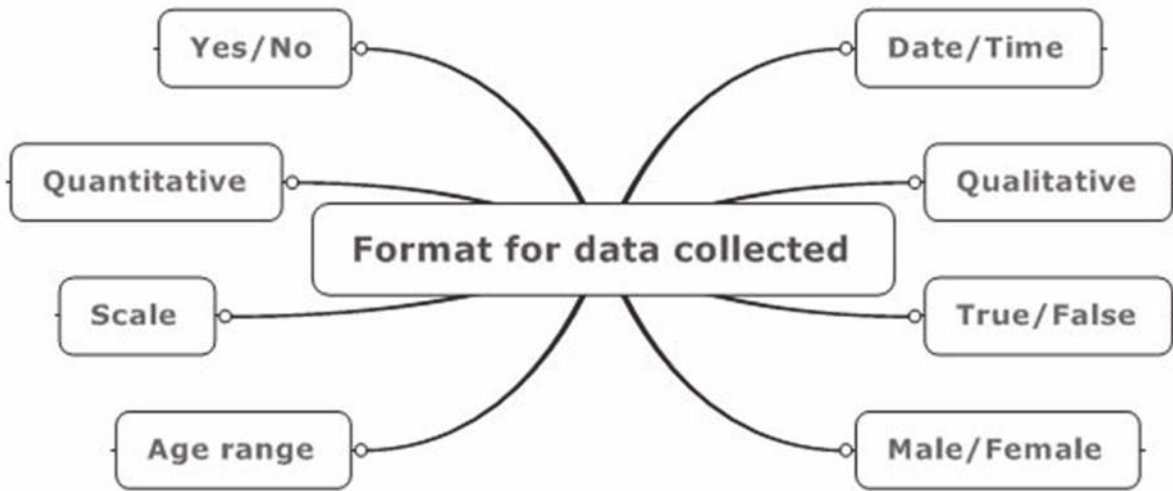
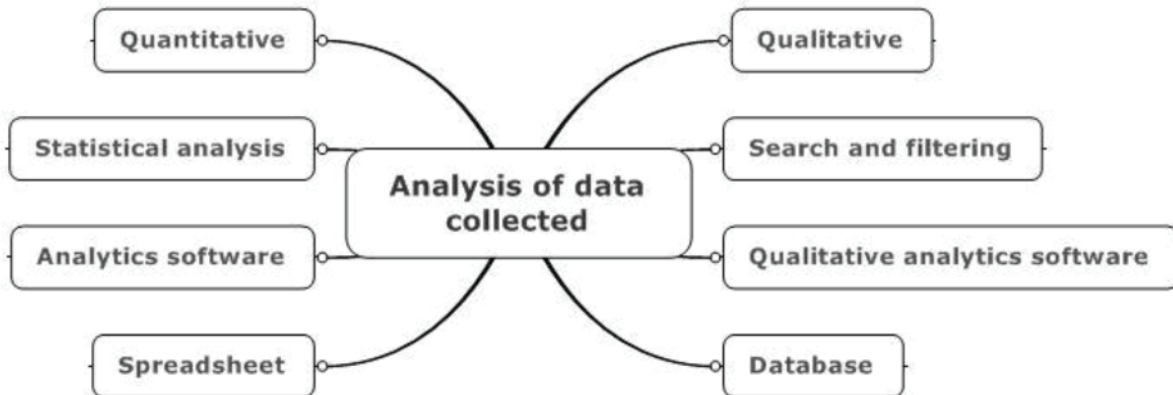


Figure 6. Analysis of data collected



Researchers should be advised to keep their formatting to a minimum in their initial draft of findings, then it is easier to insert into templates for book chapters, conference submissions and so forth, as the need arises. Figure 7 portrays the various different publishing opportunities for researchers.

Depending on work and personal commitments, different publishing venues will suit different researchers' lifestyles. Due to timetabling of contact hours lecturers may find it difficult to

commit to attending conferences during term time. Presenting at conferences may gain the researcher some acknowledgement from the conference attendees, but an article in an electronic journal or an electronic book (e-book) may be more easily accessible to many. The e-learning module could outline the content relevant to publishing in each of these different venues and highlight the advantages and disadvantages of each.

The presentation of findings or dissemination of research will be dependent on the publication

Figure 7. Where to publish

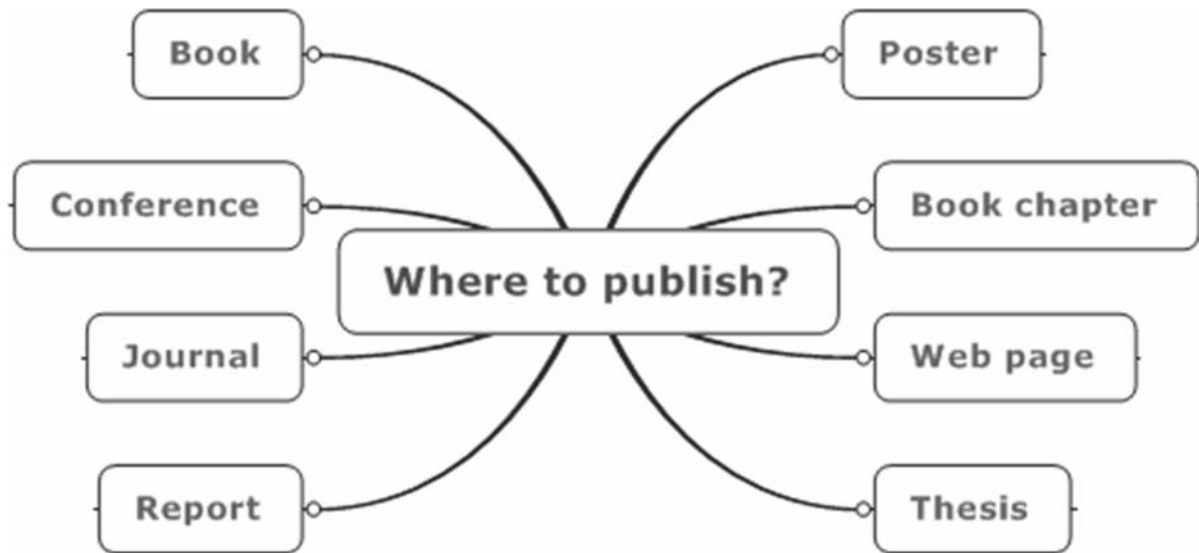
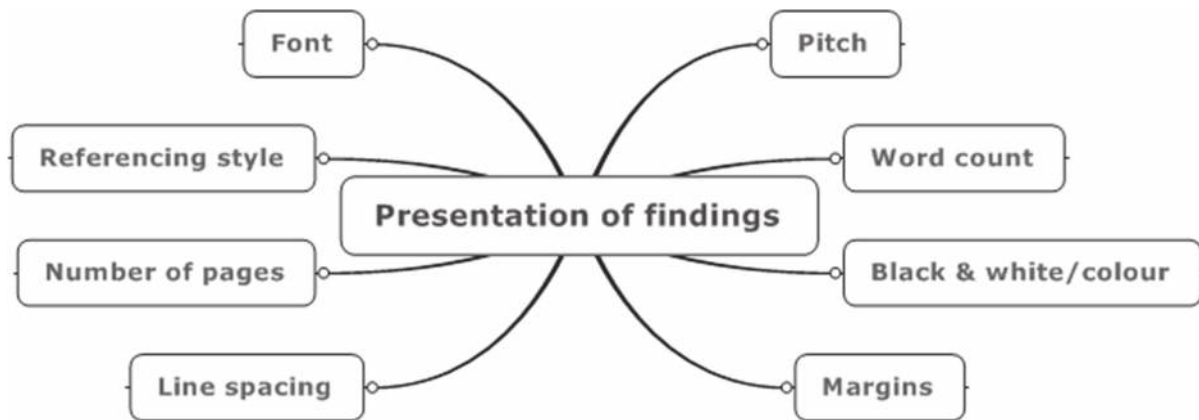


Figure 8. Presentation of findings



type selected. Different publishers require different publishing formats and different referencing styles. As previously mentioned, it is advisable when collating results to keep the applied formatting to a minimum, then the text, tables and figures can easily be inserted into the formatting required by the publisher. Some publishers will not consider papers unless they are submitted in the correct format and citations follow the required

referencing style. Figure 8 indicates some formatting issues; the requirements will differ depending on the publisher.

The combined e-learning module would conceptually appear as a combination of all the figures used in this chapter. The use of discussion boards, synchronously and asynchronously, would assist researchers understanding and use of these concepts.

FUTURE RESEARCH DIRECTIONS

To investigate if the proposed e-learning module would improve the quantity and quality of research publications, one method would be to compare the quantity and quality of the research output of researchers who have engaged with the published research output of students who have not engaged with an e-learning module. An alternative method would be to create such an e-learning module, encourage student engagement, gather student feedback and analyse the feedback to see if the creation and implementation of such a module would be perceived as beneficial to researchers. Should either of the above solutions for the proposed module be pursued, the findings will provide a good indication as to whether such an e-learning module would improve the quality of research undertaken by PhD students and researchers. The process of evaluating such an e-learning module requires further research which promises to be an interesting study. Engagement with such an e-learning module has the potential to improve the quality of research and the quantity of research publications by facilitating online peer support. Furthermore, by adding some adaptive functionality to the e-learning module students could perhaps benefit from personalised e-learning whereby learning objects would be selected by the system to suit individual students learning needs.

CONCLUSION

This purpose of this chapter was to propose the use of an e-learning module to support researchers to improve the quality of research and increase research dissemination. An e-learning module on research methods and statistical analysis would perhaps improve the quality of research by providing students with the necessary skill set to identify the most appropriate research methods

and statistical analysis to apply to their research. Thus, enabling students to effectively conduct research and subsequently analyse, interpret and contextualise the findings. In addition, the quality of research would perhaps improve as a result of the peer reviewed feedback received from the other researchers involved in the online community of practice. Opportunities for collaborative work would also be identified through discussions on research interests and approaches. Collaborative work on papers, book chapters and conference submission could increase the research output of the researchers and research groups who actively engage with an e-learning module to support researchers in higher education.

REFERENCES

- Akyol, Z., & Garrison, D. R. (2011). Understanding cognitive presence in an online and blended community of inquiry: Assessing outcomes and processes for deep approaches to learning. *British Journal of Educational Technology*, 42(2), 233–250. doi:10.1111/j.1467-8535.2009.01029.x
- Bador, P., & Lafouge, T. (2011). Comparative analysis between impact factor and h-index for psychiatry journals. *Analyse Comparative du Facteur d'Impact et de l'Indice h dans les Revues de Psychiatrie*, 35(2), 109-121.
- Bower, M., Hedberg, J. G., & Kuswara, A. (2010). A framework for Web 2.0 learning design. *Educational Media International*, 47(3), 177–198. doi:10.1080/09523987.2010.518811
- Bowman, A. (2007). Interdisciplinary research: the importance of learning other people's language. *Advances in Statistical Analysis*, 91, 361-365.
- Brannen, J. (2005). Mixing methods: The entry of qualitative and quantitative approaches into the research process. *International Journal of Social Research Methodology*, 8(3), 173–184. doi:10.1080/13645570500154642

- Cheak, A. M., Angehrn, A. A., & Sloep, P. (2006). *Enhancing the social network dimension of life-long competence development and management systems: A proposal of methods and tools*. Paper presented at the Workshop Learning Networks for Lifelong Competence Development. Sofia, Bulgaria.
- Chen, H. (2012). Introduction. In H. Chen (Ed.), *Approaches to quantitative research: A guide for dissertation students* (pp. 1-6). Cork, Ireland: Oak Tree Press.
- Chesebro, J., & Borisoff, B. (2007). What makes qualitative research qualitative? *Qualitative Research Reports in Communication*, 8(1), 3–14. doi:10.1080/17459430701617846
- Christiansen, A., & Bell, A. (2010). Peer learning partnerships: Exploring the experience of pre-registration nursing students. *Journal of Clinical Nursing*, 19(5/6), 803–810. doi:10.1111/j.1365-2702.2009.02981.x PMID:20500324
- Cole, M., John-Steiner, V., Scribner, S., & Souberman, E. (Eds.). (1978). *Vygotsky, Lev.: Mind in Society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). SAGE Publications, Inc.
- Dagger, D., Conlan, O., & Wade, V. (2003). *An architecture for candidacy in adaptive e-learning systems to facilitate the reuse of learning resources*. Paper presented at the World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2003. Phoenix, AZ.
- Davidson, J., & Jacobs, C. (2008). The implications of qualitative research software for doctoral work. *Qualitative Research Journal*, 8(2), 72–80. doi:10.3316/QRJ0802072
- Dawson, S. (2010). ‘Seeing’ the learning community: An exploration of the development of a resource for monitoring online student networking. *British Journal of Educational Technology*, 41(5), 736–752. doi:10.1111/j.1467-8535.2009.00970.x
- Dermo, J. (2009). E-assessment and the student learning experience: A survey of student perceptions of e-assessment. *British Journal of Educational Technology*, 40(2), 203–214. doi:10.1111/j.1467-8535.2008.00915.x
- DIT. (2007). *Dublin Institute of Technology*. Retrieved from <http://www.dit.ie/catalogue/Programmes/Details/DT380?tab=Additional%20Information>
- Doering, T., Pereira, L., & Kuechler, L. (2012). *The use of e-textbooks in higher education: A case study*. Paper presented at the E-Leader. Berlin, Germany.
- Dolan, D., O’Connor, C., Mullally, A., & Jennings, A. (2004). *Experience in the use of synchronous eLearning in a traditional university for non-traditional learners*. Paper presented at the Hawaii International Conference on Education. Hawaii, HI. Retrieved from www.hiceeducation.org
- Donnelly, R., & O’Rourke, K. (2007). What now? Evaluating e-learning CPD practice in Irish third-level education. *Journal of Further and Higher Education*, 31(1), 31–40. doi:10.1080/03098770601167864
- Duncan-Howell, J. (2010). Teachers making connections: Online communities as a source of professional learning. *British Journal of Educational Technology*, 41(2), 324–340. doi:10.1111/j.1467-8535.2009.00953.x
- Edwards, M., Perry, B., & Janzen, K. (2011). The making of an exemplary online educator. *Distance Education*, 32(1), 101–118. doi:10.1080/01587919.2011.565499

Technology-Enhanced Learning

- Fossey, E., Harvey, C., McDermott, F., & Davidson, L. (2002). Understanding and evaluating qualitative research. *The Australian and New Zealand Journal of Psychiatry*, 36(6), 717–732. doi:10.1046/j.1440-1614.2002.01100.x PMID:12406114
- Garfield, E. (2006). The history and meaning of the journal impact factor. *Journal of the American Medical Association*, 295(1), 90–93. doi:10.1001/jama.295.1.90 PMID:16391221
- Glahn, C., Steiner, C., De Bra, P., Docq, F., & O'Donnell, E. (2010). *GRAPPLE (Generic Responsive Adaptive Personalized Learning Environment): Second documentation and training for GRAPPLE users*. Retrieved from <http://grapple-project.org/public-files/deliverables/D9.4-WP9-SecondTrainingReport-v1.1.pdf>
- Glahn, C., Steiner, C., de Bra, P., Docq, F., O'Donnell, E., Verpoorten, D., et al. (2011). *GRAPPLE (Generic Responsive Adaptive Personalized Learning Environment): Second empirical evaluation in academic settings*. Retrieved from <http://www.grapple-project.org/public-files/deliverables/D9.5-WP9-FinalEvaluation-v1.0.pdf/view>
- Granić, A., & Ćukušić, M. (2011). Usability testing and expert inspections complemented by educational evaluation: A case study of an e-learning platform. *Journal of Educational Technology & Society*, 14(2), 107–123.
- GRAPPLE. (2008). *GRAPPLE Project Website*. Retrieved from <http://www.grapple-project.org/>
- Hassad, R. (2010). *Toward improving the quality of doctoral education: A focus on statistics, research methods, and dissertation supervision*. Paper presented at the International Conference on Teaching Statistics: Data and Context in Statistics Education: Towards an Evidence-Based Society (ICOTS8). Slovenia.
- Hoyle, C., Küchemann, D., Healy, L., & Yang, M. (2005). Students' developing knowledge in a subject discipline: Insights from combining quantitative and qualitative methods. *International Journal of Social Research Methodology*, 8(3), 225–238. doi:10.1080/13645570500154899
- Hwang, G.-J., & Tsai, C.-C. (2011). Research trends in mobile and ubiquitous learning: A review of publications in selected journals from 2001 to 2010. *British Journal of Educational Technology*, 42(4), E65–E70. doi:10.1111/j.1467-8535.2011.01183.x
- ISI. (2012). *Thomson Reuters (ISI) Web of knowledge*. Retrieved from http://thomsonreuters.com/products_services/science/science_products/a-z/isi_web_of_knowledge/
- Jung, I., & Latchem, C. (2011). A model for e-education: Extended teaching spaces and extended learning spaces. *British Journal of Educational Technology*, 42(1), 6–18. doi:10.1111/j.1467-8535.2009.00987.x
- Kalyuga, S., & Sweller, J. (2005). Rapid dynamic assessment of expertise to improve the efficiency of adaptive e-learning. *Educational Technology Research and Development*, 53(3), 83–93. doi:10.1007/BF02504800
- KDEG. (2013). *Knowledge and Data Engineering Group, School of Computer Science and Statistics*. Trinity College Dublin. Retrieved from <http://kdeg.scss.tcd.ie/>
- Lokker, C., Haynes, R. B., Chu, R., McKibbin, K. A., Wilczynsk, N. L., & Walter, S. D. (2012). How well are journal and clinical article characteristics associated with the journal impact factor? A retrospective cohort study. *Journal of the Medical Library Association: JMLA*, 100(1), 28–33. doi:10.3163/1536-5050.100.1.006 PMID:22272156

- Moderato, P. (2006). Behaviourism and the science of behaviour: Its development in Italy. *International Journal of Psychology*, (41): 6.
- Murphy, A. (2008). APEL matters in higher education. Co. Kilkenny, Ireland: Red Lion Press.
- Nigam, A., & Nigam, P. K. (2012). Citation index and impact factor. *Indian Journal of Dermatology, Venereology and Leprology*, 78(4), 511–516. doi:10.4103/0378-6323.98093 PMID:22772633
- O'Donnell, E. (2008). Can e-learning be used to further improve the learning experience to better prepare students for work in industry. (Masters in Information Systems for Managers). Dublin: Dublin City University. Retrieved from <http://arrow.dit.ie/buschmanoth/1>
- Oscail. (2007). *Distance Education*. Retrieved November 2, 2007, from www.oscail.ie
- Parkinson, M. (2009). The effect of peer assisted learning support (PALS) on performance in mathematics and chemistry. *Innovations in Education and Teaching International*, 46(4), 381–392. doi:10.1080/14703290903301784
- Piaget, J. (2008). Intellectual evolution from adolescence to adulthood. *Human Development: Reprint of Human Development*, 15(1-12), 40-47.
- Power, R., Miles, B., Peruzzi, A., & Voerman, A. (2011). Building bridges: A practical guide to developing and implementing a subject-specific peer-to-peer academic mentoring program for first-year Higher Education students. *Asian Social Science*, 7(11), 75–80. doi:10.5539/ass.v7n11p75
- Radicchi, F., & Castellano, C. (2012). A reverse engineering approach to the suppression of citation biases reveals universal properties of citation distributions. *PLoS ONE*, 7(3), 1–9. doi:10.1371/journal.pone.0033833 PMID:22479454
- Resnick, L., B. (1987). The 1987 Presidential address: Learning in school and out. *Educational Researcher*, 16(9), 13-20, 54.
- Ribot, T. (1901). *Tvorcheskoe voobrazhenie [Creative Imagination]*. St. Petersburg: Iu. N. Erlikh.
- Rovai, A. P. (2002). Development of an instrument to measure classroom community. *The Internet and Higher Education*, 5(3), 197–211. doi:10.1016/S1096-7516(02)00102-1
- Salmon, G. (2009). The future for (second) life and learning. *British Journal of Educational Technology*, 40(3), 526–538. doi:10.1111/j.1467-8535.2009.00967.x
- Scott, P., Castañeda, L., Quick, K., & Linney, J. (2009). Synchronous symmetrical support: A naturalistic study of live online peer-to-peer learning via software videoconferencing. *Interactive Learning Environments*, 17(2), 119–134. doi:10.1080/10494820701794730
- Sitthiworachart, J., & Joy, M. (2008). Computer support of effective peer assessment in an undergraduate programming class. *Journal of Computer Assisted Learning*, 24(3), 217–231. doi:10.1111/j.1365-2729.2007.00255.x
- Skinner, B. F. (1981). Selection by consequences. *Science. New Series.*, 213(4507), 501–504.
- Smyth, R. (2011). Enhancing learner-learner interaction using video communications in higher education: Implications from theorising about a new model. *British Journal of Educational Technology*, 42(1), 113–127. doi:10.1111/j.1467-8535.2009.00990.x
- Steiner, C., Hillemann, E., Verpoorten, D., Kleinermann, F., Pekczynski, P., & O'Donnell, E. (2010). *GRAPPLE (Generic Responsive Adaptive Personalized Learning Environment): Refinement and improvement of evaluation guidelines*. Retrieved from <http://www.grapple-project.org/public-files/deliverables/D8.2b-WP8-Evaluation-Guidelines-v1.0.pdf>

Thompson, L., Jeffries, M., & Topping, K. (2010). E-mentoring for e-learning development. *Innovations in Education and Teaching International*, 47(3), 305–315. doi:10.1080/14703297.2010.498182

Tous, R., Guerrero, M., & Delgado, J. (2011). Semantic web for reliable citation analysis in scholarly publishing. *Information Technology & Libraries*, 30(1), 24–33.

Unwin, A. (2007). Statistical consulting interactions: a personal view. *Advances in Statistical Analysis*, 91, 349-359.

Vygotsky, L. S. (2004). Imagination and creativity in childhood. *Journal of Russian & East European Psychology*, 42(1), 7–97.

KEY TERMS AND DEFINITIONS

Asynchronous Discussion: Refers to discussions which do not take place in real time. Each subscriber has the opportunity to research and present their opinion to a discussion board for peers to review at some later time. Asynchronous discussions enable subscribers to plan, research, structure, and reflect on their submission before they submit it to the forum for peers to review.

Blended Learning: Occurs when electronic learning resources are used to augment/enhance traditional teaching methods.

Community of Practice: Is formed when a group of people are drawn together through shared interests or goals.

E-Learning: Refers to various forms of teaching and learning which are facilitated through the use of technology.

E-Learning Module: Is stored in a predefined location on an e-learning platform and is dedicated to a particular subject area. Students are provided with user names and passwords to access and contribute to this module. Because the e-learning module is online, students can access this module at any time from any place, providing they have the appropriate computer equipment and broadband access.

Online Collaboration: Refers to people working together online to achieve a shared goal.

Qualitative Analysis: Qualitative methods facilitate the use of open ended questions which enable participants to give their views and opinions on issues without any influence from the researcher.

Quantitative Analysis: The use of techniques including ratios to analyse numerical data which represent measurable characteristics in order to make sense of available information.

Synchronous Discussion: Synchronous discussions refer to discussions which take place in real time. Subscribers respond to other subscribers' suggestions and comments without the opportunity to plan, research, structure, and reflect upon their submission to the forum.

Technology Enhanced Learning (TEL): Technology enhanced learning (TEL) refers to the support of teaching and learning through the use of technology and can be used synonymously with e-learning.

Technology Enhanced Research: Technology enhanced research has the possibility of supporting researchers through the use of technology and perhaps improving the quality of research.