

PASS Online assisting first year psychology and social science students in statistics: A 360-degree view

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Traditionally difficult subjects, such as statistics, offer a substantial learning challenge for students in their first year of university. Supplemental instruction or Peer Assisted Study Sessions (PASS) can provide students with benefits including increased confidence and grades. This project sought to compare face-to-face (F2F) sessions of PASS for the first-year psychology statistics subject PSYC123 with an online version. Employing a mixed-methods approach, including feedback from both students and PASS leaders, results indicated that online students found the platform easy to use and navigate, believing they had benefited from the sessions. All PASS students achieved higher mean grades compared to students who did not attend. PASS Online students also saw increased grades compared to F2F, although this difference was not statistically significant. PASS Leaders found that more time was needed in the online version compared with F2F, but felt that the online sessions allowed for similar interactions as those in F2F. Results indicated that online SI can be successful, however traditional activities need to be adapted and specific training is required for PASS Leaders. Time allocations, and skills development in students and leaders are required for a successful online PASS.

Keywords: Peer Assisted Study Sessions (PASS); Supplemental Instruction; online learning; first year university

Statistics subjects in university are often seen as difficult and challenging, especially for students in their first year of university study (McKenzie & Schweitzer, 2001). This transition year is challenging for many students where new types of learning are engaged in, external time pressures are experienced, and new technologies are employed (Biggs, 1999). Students often struggle with the necessity for studying statistics, being ill-prepared to tackle such a challenging subject (Simson et al., 2012). In the Social Sciences students find it difficult to marry the concepts of hard maths with human-based subjects such as psychology, social science, and social work. Mature-age students, in particular, find statistics difficult as they have not dealt with formal maths for many years, whilst other students doubt their own abilities to successfully navigate the subject (see Ramsey, 1999).

Programs such as Peer Assisted Study Sessions (also known as Supplemental Instruction: SI) offer students the opportunity to learn from each other and put into practice the equations and concepts introduced in their subject (Topping & Ehly, 2009). Traditionally held for challenging first year core subjects (Hurley, Jacobs, & Gilbert, 2006), sessions are led by student leaders, who themselves have succeeded in the subject in previous years. Leaders facilitate learning and student interactions rather than engaging in traditional teaching methods. Students lead the focus of the sessions, spending time on those areas students feel they have the most need.

As student numbers increase, time and space availability to hold face to face (F2F) sessions decrease. Today's students also face increasing time pressures, both internal and external to university study, driving the demand for out of hours classes and flexible learning opportunities (McKenzie & Schweitzer, 2001). For these reasons, more SI programs are making their way into the online space, however the unique stimuli and cues that come with F2F learning may be lost in the virtual world (Beaumont, Mannion, & Shea, 2012). Therefore, research investigating the effectiveness of online versions of PASS-type programs compared with F2F versions is necessary: in particular, multi-method approaches encompassing a range of data that is not limited to student grades but also includes student and leader perspectives. This will allow for a more in-depth investigation into the challenges facing online learning modes and help in identifying the strengths and weaknesses of moving a collaborative learning model into an online format.



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Peer Led Learning Programs

PASS at University of Wollongong

Peer Assisted Study Sessions (PASS), was first launched at UOW in 2002. PASS is traditionally run in parallel with first year, core university subjects that students find difficult. These include subjects from Business, Nursing and Psychology, with currently over 40 subjects being facilitated at UOW each year. Over the years, students have reported many positive benefits from participating in the program, including increases in grades and confidence.

PASS leaders are themselves students who have successfully completed the subject they lead. Leaders facilitate the sessions encouraging student led interactions, guiding students through various learning activities designed to help students gain appropriate study strategies. Activities can vary depending upon the subject. F2F activities may include concept lists; group brainstorming; identifying missing equation elements; or labelling diagrams. Students work individually or in small groups to come up with answers to problems. They are then encouraged to discuss their answers and their approaches with the rest of the group. In this way, students engage in peer teaching and learning.

Difficult subjects in first year

STEM (science, technology, engineering & maths) subjects are traditionally considered difficult subjects, particularly for first year university students. Dawson, van der Meer, Skalicky and Cowley (2014) point out that although the definition of difficult or 'high-risk' subjects vary they have common characteristics such as high volumes of reading, large classes, and require higher cognitive abilities. These subjects cover a range of disciplines and include subjects such as statistics (business; psychology), calculus (Maths), and general information technology, biology, chemistry and engineering subjects. Kennedy, Hefferon, and Funk (2018) reported that 52% of American students believe that STEM courses are too difficult to study. Whilst the ABC (Beech, 09/07/18) has reported that in Australia, student enrolments in high school advanced maths subjects is in decline. In particular women and ethnic minorities are less likely to be attracted to STEM subjects and courses (Malliris, 2012). Research has revealed that high school academic success, and life/work/study balance can impact student success (Whalen & Shelley, 2010). Kokkelenberg and Shina (2010) also identified maths preparedness as a predictor of student success. Attitudes toward STEM subjects can be changed, as evidenced in Tseng, Chang, Lou, and Chen's (2013) study, however the reality is that students still feel inadequate and lack confidence in tackling many first year STEM subjects.

Combined with this is the difficulty some students face in transitioning into first year university study. As well as increased demands on time, with students undertaking more work and family commitments (McKenzie & Schwietzer, 2001), some students lack the skills to adequately engage and benefit from the type of study that is required at the tertiary level (Simson et al., 2012). Blended and active learning models that encourage deeper learning, are unfamiliar to many students who do not know how to best take advantage of the flexibility offered, or how best to learn from these models (Biggs, 1999). Self-drive and motivation are needed as students are held more responsible, but less accountable, for their own learning compared to high-school learning (O'Flaherty & Phillips, 2015). Students also need to acclimatise to large classes (in the form of lectures), new technologies in the form of subject websites (such as Moodle or Blackboard), and be responsible for their own enrolment, subject selections, and timetabling. Given these issues, it is important to offer students as much support as possible to aid their successful transition into university study.

Findings in SI research suggests students who attend achieve higher average grades compared to those that do not (Dawson et al., 2014; Beaumont et al., 2012). PASS-like programs can also increase retention rates with fewer withdrawals (Dancer, Morrison, & Tarr, 2015; Smith, Wilson, Banks, Zhu & Varma-Nelson, 2014), decreased sense of isolation (Evans & Moore, 2013) and increased student interest and engagement (Dekhinnet, Topping, Duran, & Blanch, 2008). Student feedback reveals that they enjoy the flexibility of online sessions (Lim, Anderson, & Mortimer, 2016) and the collaboration with other students (Bone & Edwards, 2015; Edwards & Bone, 2012).

In the online space, findings are more varied, with little standardisation of the definition of 'online attendance' (Dawson et al., 2014). Some studies have found no differences between the F2F and online learning environments (Spaniol-Matthews, Letourneau, & Rice, 2016) suggesting that both modes have equal benefits, however, other research has found no grade increases for online cohorts (Taylor & Kelly, 2014). Lack of student uptake for online modes (Nikolic & Nicholls, 2017); lack of student engagement in feedback (Spaniol-Matthews

et al., 2016); and technical issues experienced by some students (Rourke & Anderson, 2002) may explain the variation in results.

Online delivery of supplemental instruction requires the development of a different set of skills compared to F2F modes (Beaumont, et al., 2012; Wang, Huang, & Queck, 2018). Activities traditionally suited to a classroom environment need to be adapted in the online space (Stout & McDaniel, 2006). Leaders also need to train students in the tools and communication modes available in online platforms and battle against students' reluctance to interact. (Nikolic & Nicholls, 2017). The online space can be challenging for students and leaders alike, with no guarantee that an online format can adequately or successfully emulate the F2F student experience (Fetner, 2013).

PSYC123 – Research methods and statistics.

This subject is core for both psychology and social science students at UOW. The subject, therefore, caters for a wide variety of students in terms of ATAR (65 for Social Science; 75 for Psychology) and background. Many social science students are mature-age and have not experienced formal study for many years and more than half the total cohort travel long distances to attend UOW. This is a large cohort with student numbers averaging around 600 in a session.

PSYC123 is an introductory statistics subject designed to expose students to various research methodologies and statistics. All statistics are calculated by hand, with students learning which statistics can be applied to different research designs and questions. Students are taken through several steps including analysis of the research question, selection of appropriate statistic, hypothesis generation, calculation of degrees of freedom and critical values, statistical calculation, and finally evaluation of statistical significance and interpretation of the result.

It is a fast-paced subject, taking students from calculations of the descriptive statistics including mean and standard deviation, through to inferential statistics including z-tests, Pearson's correlation, chi-square and three types of t-test. It is a challenging subject, throwing students headlong into basic algebraic concepts to more complex constructs of distributions and probability. Each week the students learn a new statistic, at a pace many students find difficult. Although the fail rate for the subject is quite low, students often begin the session with a lack of confidence and skill. Many students find basic calculations, such as square and square root, difficult without calculator assistance, and concepts of probability, hypothesis testing, and different statistical theoretical distributions are particularly problematic.

The subject has many supports in place to help students. Basic maths workshops are held in Orientation Week before the commencement of session. Whilst a mid-semester drop-in session allows students the opportunity to ask questions and get more specific help in areas they are struggling with. PASS has also been part of the supportive framework offered to students, however, places fill up fast, with many students missing out. Student demand was one of the impetuses behind bringing PASS into the online space.

The current project: PASS Online

PASS Online was funded by an ESDF UOW grant in 2017. The aim of this project was to emulate, as much as possible, the F2F experience for students in a synchronous online setting. PASS Online was not seen as a replacement for F2F sessions, but rather as a means of offering students who may not be able to attend F2F PASS with a more flexible and time-friendly option. This also meant increased access to regional students. One major consideration of PASS Online is that it needed to meet the core values and practices of traditional F2F PASS versions.

In keeping with the PASS model, student leaders were recruited to explore and test various online platforms, with Blackboard Collaborate being the final choice. The platform can be embedded directly into Moodle, meaning ease of access for students, and allows for synchronous online interactions via inbuilt tools such as break out rooms, whiteboard, chat function, 'raising hands' and file sharing. Leaders workshopped the online environment, swapping roles between leader and student to best prepare them for the session. This gave PASS Leaders an opportunity to anticipate student questions and adapt exercises that would be more suited in the online environment. PASS Leaders contributed to a PASS Online training manual as a result of this training and workshopping. In session 2, 2017, PSYC123 was chosen to be one of the subjects piloted for the online version of PASS. These sessions were promoted by both PASS and the subject coordinator to encourage student enrolment.

It was hypothesised that students would gain similar benefits in the online version, as those students who attended F2F PASS, and that PASS students would gain higher mean final grades compared to those who did not attend a session of PASS. It was also predicted that students' perceptions would reveal positive attitudes towards the PASS Online format, and that leaders, too, would find the online experience similar to F2F modes.

Method

Participants

Participants were 527 first year university students studying PSYC123. As well as a core subject for Psychology and Social Science students, PSYC123 is also a general elective subject at UOW. Those students who obtained a final mark of zero were excluded from analysis bringing the total to 514 students.

A total of 169 students attended PASS programs. Students were deemed to be PASS participants if they had attended a minimum of one, 1 hour session. In F2F only mode (PF2F) 137 students attended, whilst PASS Online only (PO) totalled 15 students, and 17 students attended a combination of both online and F2F sessions (PO+F2F). Four PASS Leaders took part in facilitating the PASS Online sessions.

Procedure

Students were briefed regarding the pilot nature of PASS Online and were asked for consent to be part of the study. Student participants were asked to complete surveys via Survey Monkey in weeks 6 and 13 of session. The survey included both Likert and open-end response sets asking a range of questions including "I have benefitted from attending PASS Online classes" and "Can you give examples of how the online version of PASS was similar to the face to face version of PASS?" PASS leaders also completed surveys at the end of session. Several questions were similar to the student surveys with additional questions specific to the Leader experience, involving both Likert and open-ended responses. Questions included "the system allowed for class interactions between students and Leaders", and "the system was easy to use for Leaders". All Likert responses were analysed via quantitative methods, whilst open responses were investigated via qualitative methodology. Qualitative data and analysis were used to help elucidate quantitative results.

Results

Quantitative

Descriptives

PSYC123 students obtained an average mark of 69.71% (sd = 16.74). Average final marks, and hours attended, by PASS mode and No-PASS are displayed in Table .1. below.

Table .1. Mean and standard deviation of final marks achieved in PSYC123 across all PASS modes and No-PASS.

	PASS mode	n	Mean Final Grade	SD	Mean hours attended	SD
PSYC123	No-PASS	345	68.00	17.80	-	-
	PO	15	73.00	20.23	4.13	3.78
	F2F	137	73.26	12.83	5.86	4.04
	PO+F2F	17	72.82	15.04	9.88	5.40
	Total n =	514				

PASS vs No-PASS

Students who attended any PASS mode achieved higher average marks compared to those that did not attend PASS (see *figure 1.* below). A One-Way ANOVA revealed that this difference was significant ($F(3,510)=3.69$, $p=.012$). Post hoc analysis showed that a significant difference was found only between No-PASS and F2F Only ($p=.010$). There were no significant differences between any other PASS modes, nor between F2F only and the other PASS modes. It should be noted that PASS mode average marks represented a range of only 0.44 marks between them. The lack of significant difference between the other PASS modes and No-PASS may be the

result of small sample numbers. The small difference in PASS mode marks should be taken as an indication of potential significant differences if sample numbers were to be increased.

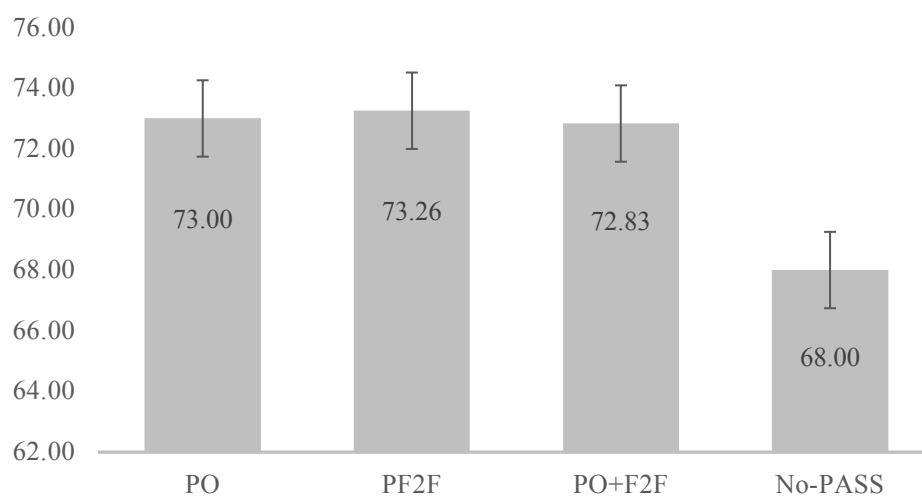


fig .1. Average % Mark Achieved - PSYC123

Likert Responses

The same Likert scale was used for the survey responses from 1 Strongly disagree to 5 Strongly agree. Student and Leader responses will be discussed separately. Table’s 2 and 3 below gives an overview of the questions and mean responses. Overall students responded positively to most of the questions. Some students did experience some technological difficulty as evidenced in their responses, however at the end of session survey when asked if students would attend PASS online again, only one student answered ‘no’ from the 14 students that responded.

Table .2. Likert mean responses from student surveys: week 6 and end of session.

	Q.1. I have benefited from attending the PASS online classes		Q.2. The system worked as expected?		Q.3. system allowed for class interactions between Leaders and Students		Q.4. The system allowed for class interactions between Students		Q.5. technology was easy to use		Q.6. The technology ran very smoothly		Q.11. IF you attend both face to face and online PASS classes, indicate how much you agree with the following statement: Attending PASS online classes is a similar experience to the face to face version of a PASS class	
	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd
Week 6	4.22	.44	4.11	.78	4.56	.53	4.22	.67	4.67	.50	3.67	1.00	4.00	1.00
End of Session	4.33	.83	3.78	.70	4.22	.47	4.00	1.05	4.33	1.04	3.78	0.99	3.80	1.19

Table .3. Likert mean responses from Leader survey: end of session.

Q.1. The system worked as I expected		Q.2. The system allowed for class interactions between Leaders and Students		Q.3. The system allowed for class interactions between Students		Q.4. The system was very flexible for Leaders		Q.5. The system was very flexible for Students		Q.6. The online experience was very similar to the face to face version of PASS		Q.7. The technology ran very smoothly		Q.8. The technology was easy to use for Leaders?	
m	Sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd
3.50	1.00	3.75	.50	4.00	.00	3.75	.50	4.00	0.82	3.25	.96	3.25	.50	4.75	.50
Q.9. The technology was easy to use for Students		Q.10. Students benefited from the online form of the PASS classes													
m	sd	m	sd												
4.00	.82	4.25	.50												

Leaders were more conservative than students in their responses, with many means near the ‘neutral’ area of the Likert. Some leaders had technical issues which caused problems during some of the sessions (which will be discussed shortly). This had the effect of lowering their Likert responses.

Qualitative

Qualitative data was transcribed from survey responses verbatim. A lack of response rate and depth of this data did not allow for in-depth qualitative analysis, therefore responses were investigated for common types of responses, as well as uncommon responses to help elucidate quantitative results.

Students

The convenience of after-work hours and being able to attend from home were the most common reasons students cited for attending the PASS online. Students who had to travel long distances or had ongoing health issues also stated that the online sessions were easier for them to attend. Most students found the system easy to use although some technical issues were experienced. Students indicated that PASS Leaders were able to fix most of these. Some students expressed difficulties in working with computers, stating that their skills were lacking.

Students conveyed many benefits including increased confidence in the subject material: “*The PASS leader has expanded my understanding of the content covered in lectures*”. PASS leaders were said to be helpful and encouraging. The ability to break off into smaller groups with other students to work on problems and then share answers helped students to understand they were not alone. Students enjoyed the interactive nature of the platform saying “*it's really easy to ask questions and get clarification*”. Functions such as chat were used often, allowing students to ask questions in private. Students believed that the online version was very similar to F2F, although more time was needed to cover the same content.

Leaders

The feedback from leaders demonstrated their varied experiences. Some revelled in the online space, adapting activities to suit the medium and successfully encouraging students to interact with each other: “*There is always a new way to approach the activity, and it has a broad range of resources that you can access because you're already online.*” Other leaders seemed to struggle with technical issues including internet speeds and connections. The fact that some students chose or could not use their computer webcam made the sessions impersonal and interpersonal connection difficult. Leaders all agreed that activities generally took longer in the online space compared to F2F modes, suggesting that the online session times be longer than the traditional 1 hour. Of the four Leaders who ran online sessions, only one said they would not like to do online again, as they preferred the interactions provided by F2F modes.

Some limitation of the platform itself were particularly challenging in a statistics subject. Formulae were not easy to write up quickly and students had difficulty writing symbols and equations on the whiteboard feature.

This could be overcome by having students sharing documents, but again there was the problem of students knowing how to construct formulae using the equation tool in word or excel. Internet connection problems also meant that some files, particularly power point slides, were slow to load. Leaders communicated that these were not significant issues, however, with their feedback being positive about the online experience for both themselves and their students: *“As good, possibly better than face to face”*

Discussion

PASS, whether online or F2F, provided students with many benefits including increased grades and increased confidence in PSYC123. Students who attended sessions of PASS achieved higher mean grades than those that did not attend any PASS. Although not all PASS modes demonstrated significance in terms of final grades, all attendees achieved higher grades regardless of the PASS mode attended. This aligns with previous research finding that SI facilitated increases in grades for attending students (Beaumont et al., 2012; Dawson et al., 2014)

Students believed that the online version of PASS had benefited them and that it was similar to a F2F experience. Students enjoyed the flexibility of the online mode and the collaboration with other students, in line with previous studies (Lim et al., 2016; Bone & Edwards, 2015; Edwards & Bone, 2012). The only time students did not report this was when technological issues interfered with their online experience. Students liked the flexibility of the online mode. Some students attended both F2F and online versions of PASS, and reported that, although slightly different, that each version offered benefits for the students. A stable internet connection and basic computer skills are both necessary for the successful running of PASS online. Students should be made aware of this when making the decision to attend online sessions.

PASS leaders reported overall success for their online sessions. They noted that some activities required more time compared to the same activities in the F2F space. This was mainly due to slower interactions between leaders and students in the online space, and, at times, a lack of response from some students. PASS leaders learned how to adapt to students who were reticent to contribute to the online sessions, using control of microphones and private messaging to either control or encourage student participation. In the online space, there were instances where students were distracted by events happening at their own location, or who left the session briefly without communicating their intentions. This had the potential to disrupt sessions, however PASS leaders quickly learned to adapt to these situations. It was suggested that students of the online sessions make a contract of understanding with each other regarding online etiquette and participation. Setting up these expectations at the beginning of session, as is done in the F2F sessions, would help students understand their responsibilities to the rest of the group.

Attendance to the online sessions was sometimes very low, making some usual PASS activities difficult to run. PASS leaders, again, were able to adapt, encouraging the few students in the session to engage in activities. Nikolic and Nicholls (2017) faced similar low participation rates in their study. It may be that, although students push for more flexible modes of learning and support, motivation, time commitments, or a lack of confidence in the online space make students hesitant to take up the opportunity when presented. Further research into the characteristics and specific circumstances of students may help elucidate how best to encourage uptake in the online learning and support spaces.

It should be noted that self-selection bias is a common problem in the SI research space. Often the most diligent students are the ones that engage in extra assistance (see Dawson et al., 2014). Although students may feel that online study of this type will give them more flexibility and be more convenient, some students may struggle with the self-driven motivation that is required (Fetner, 2013). The allure of an online learning platform that requires only a computer and time, does not always translate to good time management and/or commitment skills that students need to succeed. This is particularly pertinent in the first-year space where students are still learning how to learn and study effectively (Smart & Cappel, 2006). The self-reliant nature of online learning is sometimes met with resistance from students (O’Flaherty & Phillips, 2015), which suggests these students do not yet know how best to take advantage of online learning. More research is required into the characteristics, factors, and skills students require to be successful in the online space, and in helping them develop appropriate strategies and motivations.

Limitations

The low numbers in the online modes of PASS made quantitative statistical comparisons difficult. Results, however, revealed trends demonstrating PASS students obtained higher mean grades, regardless of the mode

attended. Increased sample numbers in future will be able to clarify if these differences are statistically significant.

Low response rates for the surveys also made in-depth qualitative analysis impossible. Not all students who responded to the surveys answered the open-ended questions, and so some opinions and insights into how PASS online ran for students may be lacking. Again, larger sample sizes in future may help elucidate this.

Conclusion

Online versions of supplemental instruction are becoming more popular. Student time demands mean that out of hours sessions and the ability to work from home are increasingly appealing. Overall, students and leaders found the online versions of PASS to be of equal benefit as F2F sessions. Computer know-how and stable internet connections, however, can detract from the student experience. Not all leaders were able to adapt to the challenges posed by the online environment, highlighting the need for good Leader training in this space. Online sessions should also be longer, as activities took more time online compared to F2F.

As demands on student time increases, more students will turn to the online environment to gain access to learning resources, such as supplemental instruction. Platforms need to be easy to use and navigate and be efficient in terms of internet load. Specific training is required for online Leaders, as well as short tutorials for students to help them learn the system. Online versions of PASS allow more students to benefit from this peer-led learning model. The skills necessary to Lead these sessions will be developed over time as Leaders gain more experience in the online space. Training and research will need to continue to identify those factors that will help students achieve consistent benefits and outcomes in the online format of PASS.

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