Research article

From Inky Pinky Ponky to Improving Student Understanding in Assessment: Exploring the Value of Supplemental Instruction in a Large First-Year Class

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Abstract

Large classes are a reality in many tertiary programmes in the South African context and this involves several challenges. One of these is the assessment process, including the provision of meaningful feedback and implementing strategies to support struggling students. Due to large student numbers, multiple-choice questions (MCQs) are often used in tests, even though researchers have found possible negative consequences of using MCQs. Giving appropriate feedback has been identified as a strategy to remedy some of these negative consequences. This paper reports on action research in which an intervention strategy was implemented in a large first year Psychology class where Supplemental Instructors (SIs) were used to give detailed feedback to students after assessments. The lecturer first modelled how to give feedback by discussing the MCQs in detail with the SIs and identifying possible errors in their reasoning and meta-cognitive processes. The SIs subsequently repeated this feedback process in their small-group sessions. After each assessment, students who performed poorly were advised to attend a certain number of SI sessions before the next test, and their attendance, even though voluntary, was monitored to determine the effectiveness of the intervention.

Students' performance in subsequent tests was compared and the results seem to indicate that attending SI sessions was mostly associated with improved test results. This strategy also appears to encourage attendance of SI sessions. In addition, students' responses in a feedback survey indicate an overall positive perception of this practice. These results can inform other lecturers teaching large classes and contribute to quality enhancement in assessment and better support for students.

Keywords

supplemental instruction; assessment; MCQs; feedback; modelling

Introduction

Tertiary education plays an important role in the development of South Africa (DHET, 2013). The South African Department of Higher Education and Training (DHET) aims to improve quality in universities, and the White Paper for Post-School Education and Training published in 2013 indicated the envisaged increase of enrolment numbers from 17.3% to 25% (DHET, 2013). However, at the same time, funding is reduced, leading to

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an increase in the number of large classes, possibly negatively influencing the quality of education (Hornsby, Osman & De Matos-Ala, 2013; Hornsby & Osman, 2014).

What constitutes a large class depends on the discipline and the learning environment, but large classes are a reality in many tertiary programmes in the South African context and this involves several challenges, especially in terms of the quality of education (Hornsby, Osman & De Matos-Ala, 2013). One of the challenges is the assessment process, including the provision of meaningful feedback and implementing strategies to support struggling students (Mulryan-Kyne, 2010). Due to large student numbers, multiple-choice questions (MCQs) are often used in tests. Although researchers have found possible negative consequences of using MCQs, giving appropriate feedback has been identified as a strategy to remedy some of these negative consequences (Butler & Roediger, 2008).

Supplemental Instruction (SI) is a model focusing on high-risk courses, designed to support and assist students academically by using collaborative learning in peer-facilitated sessions (Arendale, 1994). A lot of research has been undertaken on the use of Supplemental Instruction to support students both globally (Blanc, DeBuhr & Martin, 1983; Congos & Schoeps, 1998; Etter, Burmeister & Elder, 2001; Hensen & Shelley, 2003; Huang, Roche, Kennedy & Brocato, 2017; Kochenour, Jolley, Kaup & Patrick, 1997; Lindsay, Boaz, Carlsen-Landy & Marshall, 2017; Martin & Arendale, 1992; McCarthy, Smuts & Cosser, 1997; Ning & Downing, 2010; Summers, Acee & Ryser, 2015) and in South Africa (Harding, Engelbrecht & Verwey, 2011; Harding, 2012; Paideya & Sookrajh, 2010; Paideya & Sookrajh, 2014; Zerger, Clark-Unite & Smith, 2006; Zulu, 2003) and these studies clearly show the value of SI on different levels and its effectiveness in terms of improved student performance. However, fewer studies have explored the specific role that SI can play in the assessment process, or more specifically, in the feedback after assessment, using a quantitative methodology. The value of this study therefore lies in this niche area.

This paper reports on the first cycle of an action research project in which I implemented an intervention strategy in my large first year Psychology class. I write this paper as lecturer, who identified a problem, but also as researcher who subsequently looked for a solution to this problem and assessed the effectiveness of the intervention. The feedback strategy involved Supplemental Instruction leaders (SIs) and the use of modelling. Using SI principles such as integrating skills and content, metacognition of learning, cooperative learning and modelling (Arendale, 1993, 1994) I modelled to the SIs how to give detailed feedback to students after assessments, how to facilitate these sessions in order to help students to identify the errors they made, to understand the work better and to prepare for the following assessment. SIs subsequently repeated this process in their SI sessions. Students who performed poorly in tests were tracked to determine if the intervention helped them to improve their marks. By using a t-test, their marks before and after the intervention were compared. Students also shared their perceptions of SI and the intervention in an online survey. The main purpose of this article is to explore the value of SI in improving the assessment process in a large class.

The outline of this article will follow the process as the action research unfolded, namely: identification of the problem, planning to act, action, evaluation, reflection and

finally improvement for the next cycle. Firstly, the specific context of this research will be described, then the challenge that was experienced in this teaching and learning environment will be explained, followed by a short literature review that helped to inform the intervention strategy. The next section will explain what the intervention strategy entailed and how it was implemented. This will lead to the research questions in terms of evaluating the intervention, the research that was conducted, the results and discussion, and a reflective section on the limitations and what will be considered for the second cycle.

Background

Context of the study

The context of this research is a first year psychology class of about 600 students taught by one lecturer (me). As a result of venue size restrictions, the students are divided into two groups. The first semester module is 'Introduction to Psychology', which covers a broad span of topics, including a lot of new concepts and theories which students often find quite overwhelming and challenging. In the second semester the module is 'Social and Community Psychology'. Since these students are first years, the academic programme is structured in such a way as to assist them in the adaptation from high school. Many different assessment opportunities are provided to encourage students to study the material in small chunks. To check their understanding, there is an online MCQ quiz after every chapter. They also write four class tests, a semester test, have a group assignment and some other activities before they write the exam.

Due to the large numbers and limited resources, multiple choice questions (MCQs) are used – both in the continuous assessment in the form of online quizzes, as well as in the more formal class and semester tests. Preparing high-quality MCQs which are at the correct cognitive level and consisting of a good question (stem) and plausible choices (distractors) (Tarrant, Ware & Mohammed, 2009) allows me to assess knowledge and understanding of the theories, as well as include application-type questions by using scenarios. This method makes it possible to give prompt feedback with the marks available either immediately (in the case of online quizzes) or within a few hours after a test has been written.

Each context has its own challenges and it is important to keep the student profiles in mind (Scott, 2015; Van Rooy & Coetzee-Van Rooy, 2015). Many of the students in this particular context are first-generation students and most of them do not have English as a mother tongue, but as second or even third language. They often come from poor backgrounds and dysfunctional secondary schools, making them underprepared for university and putting them at a disadvantage, especially as far as academic literacy skills in English are concerned (Cross & Carpentier, 2009; Krugel & Fourie, 2014; Mhlongo, 2014). Since a MCQ consists of a stem (the question or scenario/case study) and then at least four distractors (the possible answers) (Jennings, 2012), this type of test often involves a lot of reading, which can be challenging for some of these students (Bharuthram, 2012; Paxton, 2007, 2009). Especially with the use of scenarios in order to include application questions, a 50-question test can easily be between eight and ten pages long. It also requires careful

reading in order to identify the correct response, and if English is not a first language, this might prove to be quite difficult (Butler & Van Dyk, 2004; Scott, 2015; Van Wyk, 2014).

At our institution, modules with large classes are considered high-risk modules and therefore support is made available in the form of Supplemental Instruction (SI). The SI leaders are senior students who did well in the module and who I select through an interview process. There are usually between six and eight SIs per semester. They attend my classes, meet with me weekly and each one conducts two to three sessions (with a maximum of 25 students) per week. The SI sessions are voluntary and open to any student to attend.

Challenge

As part of the feedback after a test, I used to make the test memo available for students on the learning management system (LMS). This allowed students to reflect on their test and identify the mistakes they made. Or rather, that was the aim with making the memo available. However, in repeating some questions in subsequent tests, I realised that students tended to study the questions by heart from the memo, without deeper understanding of the content. In repeating the question, the options would be placed in a different order, but there was a trend that students would repeat whatever happened to have been the correct response in the previous test (B for example), instead of reading and understanding the question before choosing the appropriate answer. This had an influence on their performance and contributed to a lower pass rate.

Research shows that more detailed, quality feedback can remedy this situation (Guo, Palmer-Brown, Lee & Cai, 2014; Iahad, Dafoulas, Kalaitzakis & Macaulay, 2004; Malau-Aduli & Zimitat, 2012). Due to the heavy work load, it is impossible to use class time to go through the test in order to give detailed feedback and explanations of how to approach the questions. As outlined in the context above, the limited resources do not allow for the possibility of using different types of assessment instead of MCQs. So the complex dilemma is: What can be done to improve the assessment process? How can quality feedback be provided to students in the current situation? How can students be assisted to develop test-taking skills and improve their reasoning patterns when it comes to answering a MCQ, but also understand the content better? How can we replace the "inky, pinky, ponky" strategy when doing MCQs with a true understanding of A, B and C? How can the pass rate be improved without lowering the standard? A literature review was subsequently done to explore and determine possible interventions that could be developed.

Literature Review

Large classes

Quality education is a key element in developing countries and plays a vital role in economic growth (Hornsby, Osman & De Matos-Ala, 2013). Having said this, with the enrolment numbers increasing, and limited resources, classes are increasingly becoming

larger (Ehrenberg, Brewer, Gamoran & Willms, 2001). This is often associated with lower student performance (Hornsby & Osman, 2014). However, student learning is not necessarily determined by the class size, but rather by the skills and expertise of the lecturer as well as by the use of the appropriate teaching approaches and active participation of students (Mulryan-Kyne, 2010). It is therefore important that large classes are not given to the most junior lecturer with the least experience, but rather that senior, experienced academics take this responsibility and mentor junior staff in the process (Jawitz, 2013).

Although large classes can pose a number of challenges, with innovative teaching methods it is possible to overcome these challenges and literature on large class pedagogy in higher education is increasing (Hornsby & Osman, 2014). Large classes are not necessarily "bad", since the diversity and energy can be used to incorporate interactive class activities and offer a high-quality learning experience, as long as the strengths and limitations are well understood (Jawitz, 2013).

Assessment

Assessment can be particularly challenging in large classes, especially if resources are limited and there is not extra help with marking available. Assessment can have a feed-out function, indicating performance, or it can have a feedback function, aimed at providing information that will assist in continuous learning (Knight, 2002). In addition, it is crucial that the assessment aligns directly with the module outcomes.

Different assessment strategies should be used in order to cater for the different student learning styles (Brady, 2005). Assessment should allow students to receive feedback on their learning and also give guidance to further learning (Carless, Salter, Yang & Lam, 2011; Knight, 2002) and here MCQ assessments can be valuable.

Multiple-choice questions and feedback

There are numerous advantages to using MCQs, for example, that they are more objective, more time-efficient in terms of writing and marking, and they offer the possibility to cover a wider range of the work (Higgins & Shelley, 2003). However, there are also several limitations and potential disadvantages linked to the use of MCQs.

One of the biggest questions is whether MCQs allow for higher-order cognitive skills assessment or simply factual recall, especially since critical thinking is important in higher education (Brady, 2005; Jennings, 2012). MCQs are often seen as "easy" and as testing superficial, factual knowledge only (Palmer & Devitt, 2007). However, this depends greatly on how the question is asked and whether functional, plausible distractors are given (Tarrant et al., 2009). A MCQ can be structured in such a way as to assess the higher cognitive levels of comprehension or application and therefore be versatile if designed appropriately (Brady, 2005; Yonker, 2011). In an application question, for example, a case study can be used, requiring comprehension and application skills and much more than factual, surface knowledge. In their study, Leung, Mok and Wong (2008) found that some students placed

more emphasis on understanding in preparation for a MCQ assessment and that scenario-based MCQs were perceived to help them in developing critical thinking skills.

Another problem concerns the fact that students can potentially guess the right answer (Delaere & Everaert, 2011). Students might joke saying that if in doubt with a MCQ, you can always resort to a rhyme like "inky, pinky, ponky" or "eeny, meeny, miney, moe" to help you make a choice. Although it is possible to guess, there are also ways in which guessing can be discouraged, like negative marking (Scharf & Baldwin, 2007).

Brady (2005) postulates that there are many disadvantages if MCQs are poorly designed and these can cause under-performance or over-performance which are not related to the students' ability. For example, if the distracters are not plausible, it's easier to eliminate them, even without much knowledge (Tarrant et al., 2009). On the other hand, if the distracters are not well written, they can confuse students, even though they know the theory. Since MCQs allow for assessing detail, obscure knowledge is sometimes asked instead of sticking to the module outcomes (Brady, 2005).

Setting and designing efficient, objective and high quality MCQs on the appropriate level is a skill, is time-consuming and requires commitment (Jennings, 2012). So although time is saved in the marking process, a lot of effort goes into compiling these assessments.

Research has shown that effective, quality feedback is very important in enhancing students' understanding of the questions (Lizzio & Wilson, 2008; Nicol, 2009). However, students should receive more than simply the correct answer. It is vital that they understand why they chose the wrong answer and not only where they made the wrong choice. Students need to understand and be able to explain the reason behind their choice and where they faulted in their reasoning. However, writing this type of feedback for every distracter of every question can be very time consuming.

Feedback is a pedagogical practice that supports learning, but quality feedback is often not readily available for undergraduate students (Taras, 2006). Due to the nature and format of the MCQ, students are exposed to correct and incorrect information, which could lead to confusion and negative effects. In their study, Butler and Roediger (2008) found that giving feedback after a multiple-choice test improved performance on subsequent tests, probably due to the fact that it allows the student to correct previous mistakes. They focused specifically on MCQ assessments and explored the role of feedback in increasing the positive effects and decreasing the negative effects of MCQs. By comparing different groups, either having no feedback, immediate feedback or delayed feedback, they concluded that giving students' feedback after the test is vital and that it also allowed them to have more clarity on what they knew and what they did not know (Butler & Roediger, 2008).

These findings are echoed by a more recent study by Guo et al. (2014) where feedback on MCQ assessments was given online by means of analysing the students' responses with the help of the snap-drift neural network approach. Tinto (2014) also recommends the use of technology and predictive analytics in the feedback process, which can help to reduce the workload.

Supplemental Instruction model

The SI model was founded in the early 70s at the University of Missouri in Kansas City where there was a very high dropout rate (Arendale, 1993). It was decided to move away from the traditional medical model approach of supporting students who had been identified as having a problem or being at risk, and rather implementing a non-traditional approach where the focus was on difficult or high-risk modules and where assistance was available for everyone from the start of the module (Martin & Arendale, 1992). Supporting this principle, research has also found that SI sessions are beneficial to all students, regardless of their performance, although it has more impact on struggling students (Wilson, Waggenspack, Steele & Gegenheimer, 2016).

The purpose of the SI programme is to increase academic performance and retention by providing opportunities for students to be involved in collaborative learning in peer-facilitated sessions. Sessions are open to all students and attendance is voluntary (Arendale, 1994).

Prospective SIs are expected to meet certain criteria before being considered as a possible candidate. They are students who have completed the module before, preferably with the same lecturer, and who have performed well. The SIs act as "model" students by showing the students how successful students think about the module and process the module content. After they have been selected, they receive training in collaborative learning techniques which assist the students in knowing "how" to learn (transferable academic skills), as well as "what" to learn (content) (Arendale, 1994; McGuire, 2006).

The theoretical framework in which the SI model is embedded, includes a wide variety of important learning theories including Piaget's constructivism, Vygotsky's Zone of Proximal Development, Tinto's Model of Student Retention, Weinstein's metacognition, Collaborative learning (Dewey and Bruner), Keimig's Hierarchy of Learning and Improvement Programs and Dale's Cone of Experience (Arendale, 1993). Social learning theory and the concept of modelling also play an important role, especially in the intervention discussed in this paper. It is of vital importance to train SIs well in the theories underpinning the SI model so that they can implement it successfully in the sessions (Jacobs, Hurley & Unite, 2008).

There have been many studies focusing on the effectiveness of SI (Coletti et al., 2014; Fayowski & MacMillan, 2008; Kilpatrick, Savage & Wilburn, 2013; Latino & Unite, 2012; Malm, Bryngfors & Mörner, 2012; Okun, Berlin, Hanrahan, Lewis & Johnson, 2015; Summers et al., 2015; Terrion & Daoust, 2011). In a systematic review of the relevant literature between 2001 and 2010, Dawson, Van der Meer, Skalicky and Cowley (2014) found that SI participation is correlated with improved performance as well as lower failure and withdrawal rates. These studies did not only look at effectiveness from an academic performance perspective, but also included overall graduation rates, the impact on the development of academic skills as well as the effect on general well-being, social relationships and engagement.

These results are also reflected in more recent studies (Malm, Bryngfors & Mörner, 2015; Paloyo, Rogan & Siminski, 2016; Ribera, BrckaLorenz & Ribera, 2012; Wilson & Rossig, 2014). SI improves students' long-term retention of the module content (Price, Lumpkin, Seemann & Bell, 2012), helps them to be more engaged in their learning while getting a deep understanding of the work (Paideya & Sookrajh, 2010, 2014) and also contributes to their sense of belonging (Summers et al., 2015). With the influence of technology, a recent study (Hizer, Schultz & Bray, 2017) explored the effectiveness of offering SI sessions online and found that it had similar effects to the face-to-face model.

Methodology

The intervention

The intervention that was implemented is a discipline-specific strategy that took place within the first year psychology modules, with a very close collaboration between the SIs and the lecturer of these modules.

As I have already indicated, research has emphasised the importance of effective, quality feedback in enhancing students' understanding of questions in a MCQ assessment. Although feedback can be given in a written format, students might still not fully understand or might not take the time to read it.

The fact that the SI model is based on, among other things, modelling by senior students and the development of skills (not only a focus on content), prompted me to take this modelling a step further. The intervention is based on allowing the students to get quality feedback on the tests, in small groups, via the SIs. However, it was important to ensure that the SIs were empowered with the necessary skills to be able to give this feedback.

Instead of making the test memos available to the students on the LMS, I made it available through the SIs. After every test, the SIs were required to attend a meeting with me to which each one had to bring a memo for the test that they had worked out themselves. This ensured that they went through the test thoroughly and had a similar experience to the students in considering all the options in the process of deciding which option they considered the correct answer. During the meeting, I modelled the feedback process, illustrating how the feedback should be given to allow for better understanding and deeper learning. Based on what the SI leaders chose as answers, each question and distracter was discussed in detail, allowing me to identify possible errors in the SIs' reasoning and understanding while illustrating how to address these errors.

With the correct memo, the SIs subsequently took this discussion to the small-group sessions where they repeated the feedback process with the students. The fact that this was the only way students got access to the memo aimed to encourage students to attend these sessions.

After each assessment students who performed poorly were advised to attend a certain number of SI sessions before the next test. This number differed, depending on the available time before the next test. Attending SI sessions remained voluntary, but in order to determine the effectiveness of the intervention, students' attendance was monitored.

It is important to emphasise that the sessions were still open to *everyone* and that the attendees consisted of good, average and struggling students. In line with the SI design, this is not a remedial programme and the sessions are not focused on or exclusively for students who performed poorly. In addition, it is often the interaction between fellow students that promotes a conducive learning environment.

Assessing the intervention

In assessing the effectiveness of the intervention as well as the value of SI from the students' point of view, the following questions guided the enquiry:

1. What are students' perceptions of the value of SI, in particular in assessment?
2. What effect does the intervention have in improving students' performance?

Action Research

In this study, action research was used as it allowed me to focus on a practical problem in the teaching and learning environment and enabled me to look for a practical solution in my specific context. Action research is cyclical in nature (Maree, 2007). The current paper reports on the first cycle of this research.

As previously explained, certain aspects of my teaching practices needed attention, and action, in the form of an intervention, to improve practice. After identifying the challenge, a scan of literature informed the planning and implementation of the intervention. Assessment of the intervention had to be done to determine whether practice was indeed improved (McNiff, 2013). The final step was to reflect and amend or improve the practice for the second cycle (Laycock & Long, 2009). The reflection also allowed for my professional development, as the lecturer (Kayaoglu, 2015; Ryan, 2013), for practices to change (Kemmis, 2009) and for enhancement of the scholarly approach to teaching and learning.

Action research is often a multi-method approach, using a holistic perspective to solve the problem at hand (Maree, 2007). In this study, in addition to the reflection and literature review to develop the intervention strategy, a survey was used to acquire students' feedback on the strategy and students' marks were monitored to determine whether the strategy improved their academic performance.

Data collected

In the Feedback survey, students were asked questions about SI in general (whether they attended, the value of SI sessions) and also more specifically about the intervention strategy (whether it encouraged them to attend SI sessions and whether it helped them to improve academically). A Likert scale was used for most of the questions in collecting quantitative data. The last question was an open-ended question where students could give feedback in their own words regarding the role SI played in their journey as first years.

The students who underperformed in a test were tracked after the test and in subsequent tests. Pre-intervention and post-intervention test performance scores were used for students who were part of the intervention strategy, to determine whether their performance improved.

Population

The population in this study constituted 219 of the approximately 600 first-year psychology students at the Mafikeng campus of the North-West University. Participation in the study and being part of the intervention strategy was voluntary. For ethical reasons, students completed the feedback survey anonymously and no names were used at any point.

A total of 219 students completed the feedback survey electronically. The number of students who attended the SI sessions where the intervention strategy was put in place, varied from test to test.

Results

In what follows, the results of the first stage of the action research will be given. These results were obtained from the feedback survey that was done electronically on eFundi (a Sakai LMS) at the end of the semester, as well as from the students' performance, for which the t-test results will be given.

1. What are students' perceptions of the value of SI, in particular in assessment?

With the aim of validating the responses received in the survey, the students who completed the online survey were asked whether they actually attended SI sessions and how often. Only 15% of the students who responded in this survey had never attended SI sessions. A total of 85% of the respondents did attend the sessions, even though some attended more often than others. It can therefore be concluded that the results from this survey reflect students' perceptions accurately.

In gauging the students' perceptions of SI, they were asked to indicate to what extent they think they would make use of the SI services in the future. Their responses are shown in the chart that follows.

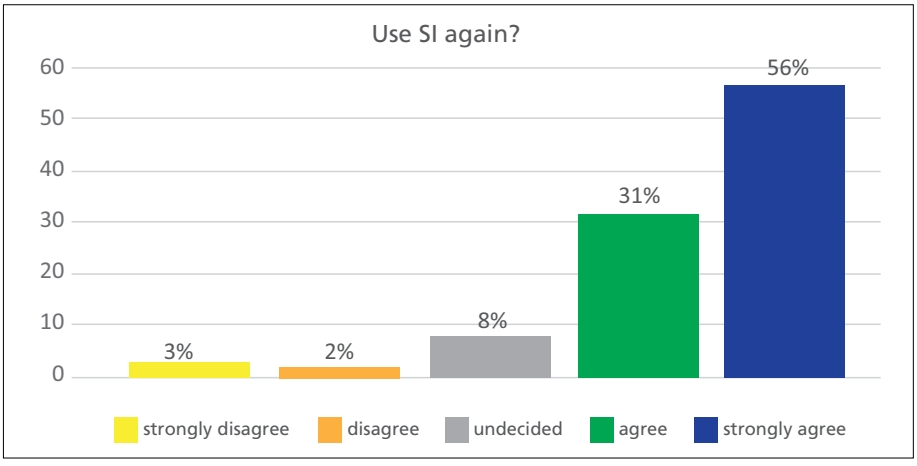

Figure 1: Future use of SI service

Their experience of SI as first years encouraged 87% of the respondents to indicate that they will continue to make use of this service.

In order to get a better idea of how the students were helped by attending SI sessions, they were given a list of possible areas and could select as many options as they thought applicable in terms of their personal experience. The following shows the percentage of respondents who selected each option.

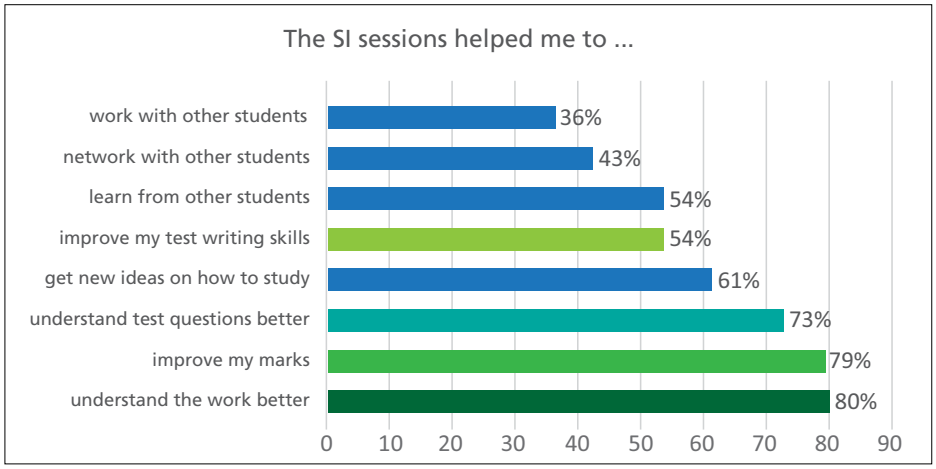

Figure 2: The value of SI sessions as perceived by students

This graph gives a clear picture of the variety of areas in which students feel they were assisted by attending SI sessions. In terms of the specific feedback strategy under investigation in this study, it is evident that the test feedback made a difference. Students indicated that the SI sessions helped them to improve their test writing skills (54%), their understanding of test questions (73%) and their overall understanding of the work (80%) which also resulted in better performance (79%). These results concur with previous research that found that quality feedback can have a positive influence (Butler & Roediger, 2008; Lizzio & Wilson, 2008). It also indicated that the use of SIs in providing feedback in the assessment process, helped students move away from the random guessing associated with MCQs (inky, pinky or ponky?) to understanding the questions and the different possibilities (A, B and C) as they developed test-taking skills.

The survey also included two separate questions that dealt with this particular feedback intervention. After every test, I posted a list of student numbers of the students in need, who were advised to attend SI sessions before the next test. Students were asked to indicate whether this practice encouraged them to attend sessions and whether attendance helped them to improve their marks. The graph below shows the results.

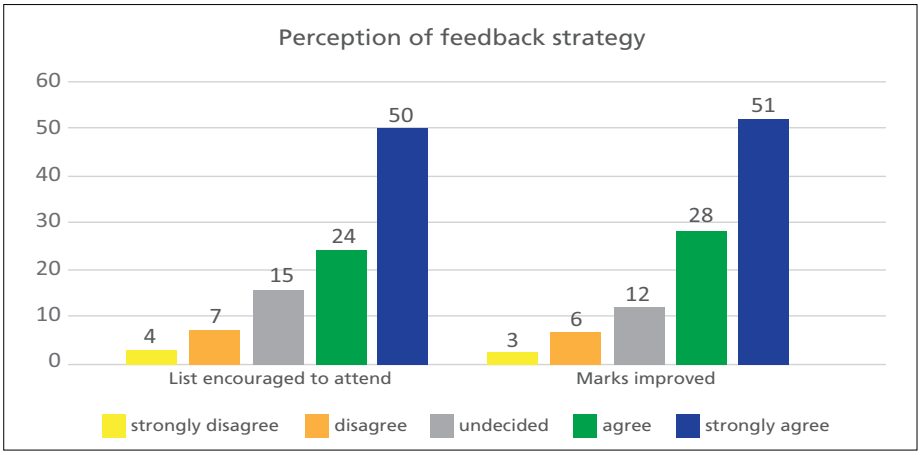

Figure 3: Students' perceptions of feedback strategy

Being in a position of need after a test and receiving the directive and advice to attend sessions did encourage students and helped them to consequently improve their marks.

The last question in the online survey asked students to give feedback on how the SI sessions helped them in their journey as first year students. The themes that emerged from these responses support the results of the preceding questions, and also give some more insight and possible avenues to explore in future research.

In terms of the specific intervention which is the focus in this article, the following themes were identified:

- Improvement in test-writing skills
- Better performance in tests
- Enhanced understanding of content and questions
- Increased confidence in approaching MCQ tests

To illustrate the perception that the SI assistance was valuable in assessment and in improving marks, here are a few quotes from students:

> *"My SI always made it easy and normal for us to participate in sessions without being ashamed. My marks improved drastically, I went from 46% to 48% then from 48% to 64% and then I got a distinction on my last test 88%."*

> *"The SI helped me to improve from zero to hero."*

> *"SI sessions are very informative and guide you on test writing skills and what to actually look at when preparing for tests and exams."*

> *"The SI helped on how to tackle the multiple-choice questions, how to prepare for the test and also to be able to understand the questions on the test."*

> *"It helped me understand how to interpret questions and understand them to choose correct answers during my tests."*

"SI helped me to have better understanding about this module. At first I failed, and again I failed second test. After that I was advised and convinced to attend the SI. Since I started attending SI I was doing well with my tests and I started to love psychology.

Thematic analysis of the students' responses on the question: 'How did SI sessions help you in your journey as first year or doing first year psychology?' yielded the following additional themes. Some quotes are given to illustrate these themes.

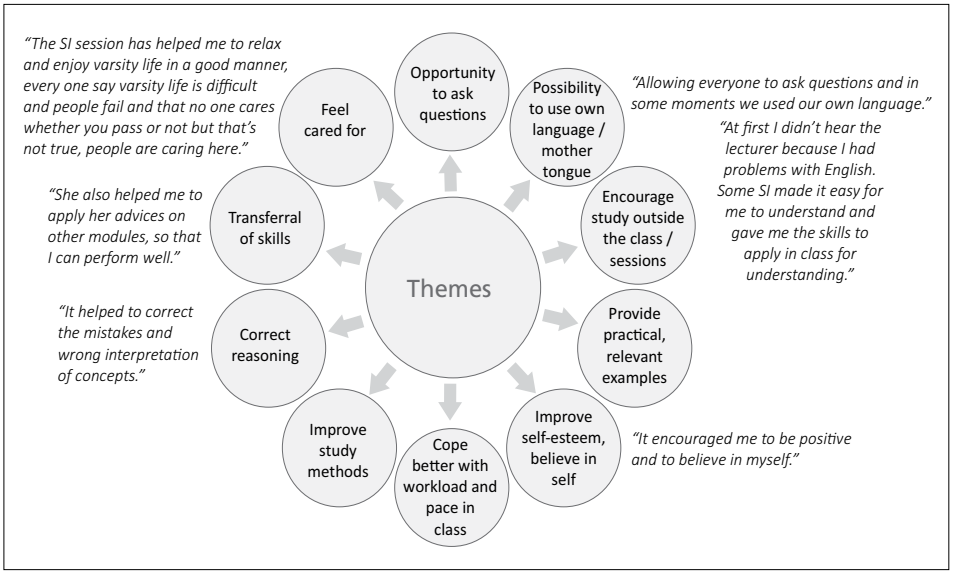

Figure 4: Value of SI: themes

2. What effect does the intervention have in improving students' performance?

By using a dependent t-test with paired samples, the pre-intervention and post-intervention test performance scores were compared to determine whether their performance improved as part of the intervention strategy. Since attendance was voluntary, some students attended whilst others did not. Comparing these two groups enabled me to link the difference to the intervention strategy implemented.

Since non-random sampling was used and attendance was voluntary, statistical inference about the population cannot be drawn. Therefore effect sizes, more specifically Cohen's d, was calculated to indicate the practical significance of any differences found. According to Ellis and Steyn (2003), a small effect would be d=0.2, a medium effect d=0.5 and a large effect d=0.8. This could also be indicated as practically non-significant, practically visible and practically significant.

Table 1: Results of t-test

SI Session	Assessment	Mean	Standard deviation	Effect size
Attended	Early detection quiz	44.51	11.034	1.18
	Test 1	57.53	10.451	
NOT Attended	Early detection quiz	43.95	10.815	0.91
	Test 1	53.74	12.488	
Attended	Test 1	41.16	6.36	1.08
	Test 2	48.00	11.49	
NOT Attended	Test 1	40.19	5.98	0.42
	Test 2	42.69	10.08	
Attended	Test 2	40.24	6.371	1.37
	Semester Test	48.94	8.771	
NOT Attended	Test 2	39.53	6.511	0.69
	Semester Test	44.03	8.848	

Based on the effect size of 1.18, 1.08 and 1.37, the difference in the test scores of the students attending the SI sessions is practically significant, improving in performance for the following assessment (44.51 to 57.53; 41.16 to 48.00; and 40.24 to 48.94). The test scores of the students NOT attending the SI sessions improved much less, as indicated by the smaller effect sizes of 0.91, 0.42 and 0.69. Thus one can conclude that the intervention did have the desired effect.

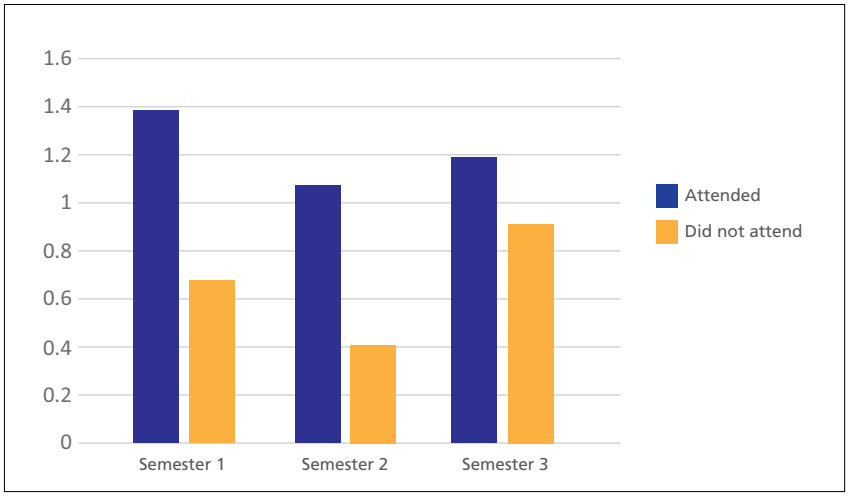

Figure 5: Effect sizes indicating practical significance

This graph portrays the influence of the SI sessions and in particular the intervention in the form of the feedback strategy that was offered during the sessions. There is a notable

difference in terms of performance between the group that attended SI and the group that did not attend. These results give some indication that this type of intervention can play a valuable role in assisting students in understanding the assessment process and improving their performance and concurs with other research that SI can be effective in improving students' performance (Kilpatrick et al., 2013; Malm, Bryngfors & Mörner, 2015; Paloyo, Rogan & Siminski, 2016; Summers et al., 2015).

Discussion

In a feedback survey, students were asked questions about SI in general, and also about the specific intervention strategy. Responses in the feedback survey indicated an overall positive perception of this practice.

Students were asked how often they attended SI sessions and they were also asked to indicate how the sessions helped them. The responses that were chosen by the highest percentage of students are linked to the feedback intervention, indicating that the strategy had positive influences. The sessions are also believed to allow students to work and network with other students and to learn from them, as is the purpose with the collaborative learning SI model (Arendale, 1994). The fact that students who are struggling are specifically reminded about the availability of SI sessions and advised to attend, also appears to encourage attendance of SI sessions.

From the findings in the open-ended question, it is clear that the SI sessions played a big role in assisting the students in understanding assessment, which confirms findings in other studies (Malm et al., 2012; Ribera et al., 2012). In addition, from this data interesting new themes emerged that would allow for further exploration in the next cycle. Keeping the student profile in mind, language seems to play an important role and the fact that some SIs are able to communicate in the students' mother tongue, might play a vital role in the success of this strategy.

Students' performance in subsequent tests was compared and the results seem to indicate that attending SI sessions was mostly associated with improved test results. These results can therefore inform other lecturers teaching large classes and contribute to quality enhancement in assessment.

Reflection: Limitations of the Study

It is vital to be aware of any limitations in a study. In the action research process, it is also important to reflect on every action in a cycle and determine how practice can be improved and what else can be done. This has been an exciting learning process for me as the lecturer.

There are several limitations, both in terms of the methodology and research, as well as the intervention itself. One limitation of this study is that it was conducted on a small scale, within one class in one specific context. This means that one cannot generalise or assume that it would have similar results in a different context. However, as part of a teaching approach, these principles might be deemed valuable to lecturers in similar situations, experiencing similar problems. As far as the t-test results are concerned, this study only followed the students that were struggling and did not consider the impact of

the intervention on the other students, whether average or good. This could be addressed in the second cycle.

In terms of the intervention, is has to be mentioned that it is rather time consuming and requires dedication. The time spent with the SIs after every test to model the feedback process is considerable. However, it is still much less time consuming than giving the feedback in a large class or drafting detailed individualised written feedback on all the questions in every test. The added value of this process for both the SIs and the students should also be taken into account when considering this option. The advantage of having done this with the first group of students, is that SIs for the next year will already have experience of this process (having been in the sessions) and have been exposed to different models (the different SIs they attended sessions with) before they start modelling the behaviour in sessions to the next group of first years. This prior experience also makes my modelling easier and quicker, since they are already familiar with the process. Having experienced this effect, I do believe that it can be a sustainable process that can help students develop.

Second Cycle of the Study

The focus in this research was on the students in need. In subsequent cycles, the other students could also be included to see whether SI feedback helped to improve their test-taking skills and enhance their overall performance in the module. Another approach that could be considered is to start the feedback process by giving students detailed written feedback for the online quizzes while still continuing with the modelling through the SIs after the tests.

In terms of assessing students' as well as SIs' experience of the process, more qualitative data will be collected in the next cycle. This could be done by having focus group interviews with some of the students, but also with the SIs in order to determine what the SIs themselves gained from being involved in this process. Did they also develop skills that helped them in their own studies?

Investigating the transferability of these skills to other modules will also add to understanding the value of this practice, by asking students if the intervention helped them in other modules as well. Exploring the development of meta-cognitive skills as well as other possible influences (like the role of language) will further extend our understanding of the role and value of this intervention.

In the second cycle, the results of first cycle will be displayed to the new group of first year students as motivation for them to attend SI sessions since Goldstein, Sauer and O'Donnell (2014) found that students' perceptions of the value of SI sessions can influence their motivation and increase their attendance.

Based on the work of Quinton and Smallbone (2010) and supported by the findings of Boud and Molloy (2013), I can also consider asking students to reflect on the feedback with the purpose of helping them to apply their learning in a feed forward into the next assessment and developing self-regulation in the process.

Conclusion

In this paper, I discussed an approach to giving valuable feedback in the context of a large class by using Supplemental Instruction and modelling. The results of this study showed that the intervention seems to improve students' performance, and that students had a positive perception of the process. SI can play a valuable role in the assessment process in a large class, especially in giving quality feedback on assessment that allows students to learn test-writing skills and develop their reasoning, but also to understand the content better. Instead of using "inky, pinky, ponky" strategies to answer MCQs, students were empowered to understand the different options given in A, B and C and make the appropriate choice. These results can inform other lecturers' practice in teaching large classes, and contribute to quality enhancement in assessment and better support for students. Even though it was done in a very specific context and within a psychology module, this strategy could also be used in other contexts and disciplines.

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