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R. Blunt

Nelson Mandela Metropolitan University, South Africa

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A Comparison of Medical Students' Preferences for Structured and Unstructured Peer-Learning

Richard Blunt^{1,2}

¹*Department of Educational Services: St. George's University, Grenada*

²*Research Associate: Faculty of Education, Nelson Mandela Metropolitan University, South Africa.*

ABSTRACT

A survey asked medical students studying the basic sciences to identify effective learning strategies. The purposes of the survey were three-fold: firstly, to identify learning strategies that students prefer; secondly, to encourage students to evaluate their learning strategies; and thirdly, to inform faculty about their students' learning strategies.

This paper compares the students' preferences for informal peer-learning and Supplemental Instruction. The survey revealed that students use groups discerningly for both learning and support. They believe that SI is valuable for when they need help, for developing understanding, for preparing for tests, and for motivation. The paper concludes with a critical discussion of the students' choices and recommendations about how faculty and students might use SI to strengthen the learning culture of a course.

INTRODUCTION

St. George's University School of Medicine admits 400+ students per semester. The School focuses on teaching large classes with an extensive student support program. It creates capacity through the Department of Educational Services (DES), which uses Supplemental Instruction (SI) (Arendale, 1994) to generate capacity.

SI programs remove the stigma associated with learner support by focusing on difficult or "at-risk courses" rather than at-risk students. By virtue of its participatory and interactive process, SI is a comprehensive "active learning strategy" (Angelo and Cross 1993) in which small groups of students meet to discuss what happened in class and to prepare for assessments, facilitated by a trained SI leader.

SI leaders are near-peers (Vygotsky, 1978), students who have succeeded in the course, and return to help the next class. They collaborate with faculty, providing feedback about the quality of learning in the course (the feedback loop). Besides their initial training, program coordinators give SI Leaders on-going training, providing mentoring and quality control, based on observations of sessions and discussions of student feedback. Participation in training is a contractual obligation.

Membership of SI groups is normally voluntary, and the agenda for each session is predominantly student-driven. Students bring their lecture notes and questions, and SI facilitation strategies promote higher order learning through problem solving.

Approximately 100 of the 170 SI groups currently running throughout St. George's University are devoted to the Medical School program, of which 30 support the Pre-Medical program, covering anatomy, physiology, biochemistry, molecular biology and microbiology.

The character of SI groups varies with the subject. For example, anatomy requires less procedural learning than physiology and biochemistry. Moreover, SI leaders tend to combine the pure SI facilitation model with some explanation in accordance with the preparedness of the group.

The survey questions reported in this paper addressed which peer-learning strategies medical students perceived as most valuable. The aims of the survey were to help students identify and evaluate their learning strategies, and to inform faculty about the findings with a view to helping them improve their teaching. Research demonstrates that faculty influence students' learning strategies. For example, Talmage *et al* (1984) found that when teachers develop "cooperative goal structuring strategies" they change the learning environment of the classroom, resulting in gains in achievement.

Peer-learning provides an opportunity for students to "learn to learn" (Connor, 2007). SI creates a context for students to analyze and strategize about the learning conditions that faculty create. SI also offers opportunities for students to give faculty feedback about how they might improve their teaching.

SI is therefore a strategy for enhancing the teaching-learning culture of the classroom. In the words of Clark-Unite (2006, p. 128), "SI transforms the educational style and approach to teaching by providing space for academic debate and critical thinking, class group work, facilitation, redirecting questions, discovery learning, reflection/ paraphrasing, and evaluation in the classroom."

LITERATURE REVIEW

Students' perceptions of their most effective learning strategies are metacognitive. Metacognition refers to the regulation of one's own cognition (Brown, 1987). As an application of cognition, metacognition involves both knowledge and skills, and like any other form of cognition, is underpinned by attitudes.

Cognition entails information processing and retention. Reese (1998) describes how cognitive science understands these processes. First, the object to be learned must catch our attention. If it is not immediately rehearsed, it is lost. Given that it is rehearsed (using repetition and/or association), it is retained for about a day. To develop into a long-term memory, it must be "generalized" by associating it repeatedly with a number of established (long-term) memories associated with varied contexts. Long-term memories can "decay" if not revived, but more often they are lost or altered when they become subject to interference from

contradictory information. Long-term memories are most efficiently recalled when they form part of a stable group or network of ideas (e.g. hierarchies, categories). Interrelated memory structures which receive and retain new information are sometimes referred to as schema: "Schema theory held that prior knowledge is organised into structures in semantic memory so that incoming information that is related to this knowledge can be accommodated in memory. When incoming knowledge cannot be accommodated within a schema it is easily forgotten, and may be less easily understood (Anderson and Wilson, 1986). Of particular importance to instruction was the realization that learning and memorization came more easily when it could be related to the learner's own experience and self concept (Schmeck and Meyer, 1984)." (Blunt, 1992, p. 41)

Metacognitive knowledge constitutes complex webs of schema associated with the learner's self-concept. For example, a learner who believes that she learns well in a group would readily project her belief onto new group experiences as an expectation, and would resist contradictory evidence using normal psychological defence mechanisms. This theory explains the development of students' preferences for learning strategies.

Discussions of topics in SI sessions promote the stages of information processing. SI Leaders prompt group members to take notes during their lectures (or readings). This helps the first stage of recall. Then (preferably the following day), the SI Leader asks students to compare and contrast their notes, and use them to answer questions and problems in their own words. This takes the information into the second stage of long-term memory. Further reviewing and relating information helps to integrate it with the students' schema.

The key to integrating information into schema lies in understanding. In the parlance of information processing, understanding is "deep" learning, whereas memorizing without understanding (reproductive or rote learning) is "surface" learning. Meyer (1988) found that deep learning was associated with a qualitatively rich context, and included both strategic thinking and surface learning. Therefore, deep learning comprised more integrated, broader and flexible schema than surface learning: "The meaning orientation is associated with a rich, holistic perception of learning context that embraces deep, strategic and surface perceptions. All of these perception categories have some explanatory power for the meaning orientation. The reproducing orientation, on the other hand, is associated (if at all) with an impoverished (surface) perception of learning context, the qualitative extensions of which are weakly perceived or perhaps not even comprehended by many students. There is thus a conservative basis, from a teaching perspective, for helping students to construct wider and more meaningful (deep) perceptions of learning context." (Meyer, 1988, p. 81)

Deep learning is one of the goals of group work. SI strategies aim to encourage students to appropriate learning by discussing it with peers. The group is then able to take learning a step further and use the information strategically to consider how to address problems and questions.

Group learning is an important teaching strategy. Chickering and Gamson's (1984) review of decades of educational research found that good teaching "encourages cooperation among students" and "active learning." Both are core strategies for SI.

A literature review by Astin (1987:17) "found that collaborative approaches produce better learning in the vast majority of studies." Apart from the motivational and social gains, groupwork helps to develop higher order skills involving critical thinking and problem analysis.

The notion of learning from peers was brought to prominence by the work of Vygotsky, published in Russia in the 1920s and rediscovered in the West in the 1960s. Much of his work anticipated contemporary social science, which understands that the mind develops through interaction with society. He is best known for his term, the zone of proximal development (ZPR): "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers." (Vygotsky, 1978, p. 86)

Educationists often focus on Vygotsky's reference to "more capable peers" and neglect his view of cognitive development. The ZPR, "defines those functions that have not yet matured but are in the process of maturation, functions that will mature tomorrow but are currently in an embryonic state." (Vygotsky, 1978, p. 86) Thus, learners need to experiment with half-formed notions before forming concepts. The ZPR, "enables us to propound a new formula, namely that the only 'good learning' is that which is in advance of development." (Vygotsky, 1978, p. 89) This "maturing of functions" takes place while interacting with others: "learning awakens a variety of internal developmental processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers" (Vygotsky, 1978, p. 90).

Similarly, social constructionism (Berger and Luckman, 1967), and schema theory hold that individuals "construct" their minds through social interaction. This differs from Piaget's (1972) view that the mind goes through stages of biologically determined development. Vygotsky suggests that we are not so determined.

Vygotsky identifies three key tasks for the constructionist approach to learning. The first is to focus on the process of constructing concepts rather than providing conclusions. For example, explanations that introduce new concepts with definitions create premature closure. Secondly, learners need to discuss ideas with others to "construct" their concepts by building on what they already know. Thirdly, the context of shared problems create direction and motivation for learners to strive for conclusions.

Vygotsky's recognition of the role of problem-solving in learning has been employed in problem-based learning (PBL), which has much in common with SI, and has certain advantages over conventional teaching methods. In medical education, for example, Nandi et al (2000, p. 301) found that, "Students of the problem-based learning curriculum found learning to be 'more stimulating and more humane' and 'engaging, difficult, and useful', whereas students of the conventional curriculum found learning to be 'non-relevant, passive, and boring'. Students who used the problem-based learning method showed better interpersonal skills and psychosocial knowledge, as well as a better attitude towards patients."

PBL and SI group leaders share similar functions. The PBL facilitator helps students to work on poorly structured problems to stimulate learning (Barrows, 2000). The role of the PBL facilitator is to help students become independent learners, taking advantage of team dynamics. “The facilitator guides students in the learning process, pushing them to think deeply, and models the kinds of questions that students need to be asking themselves, thus forming a cognitive apprenticeship.” (Hmelo-Silver and Barrows, 2006, p. 24)

There are key differences between SI and PBL. SI facilitators are near-peers, whereas PBL facilitators are lecturers, and tend to be teacher-centered, “... asking known-answer questions, listening to students’ responses, and then evaluating the responses.” (Hmelo-Silver and Barrows, 2006, p. 22) Secondly, SI groups are normally voluntary, whereas PBL groups exist for the duration of their assignment and have longer to develop through the stages of “forming, storming, norming and performing” (Smith, 2008). This difference may create the erroneous perception that SI is a remedial strategy.

SI also differs from “cooperative learning” (Johnson and Johnson, 1994). Although both rely on group members to become interdependent learners, accountability is higher in cooperative learning because there are prescribed assignments. Cooperative learning groups are also more accountable than SI groups for evaluating their process. By contrast, membership of SI groups is usually voluntary, and the agenda negotiable.

Debates about the comparative advantages of whole class and small group learning reflect the preferences of teachers and students. While some students enjoy working in groups and teams, and find advantages in collaborative learning, others do not. The findings of the survey reported here illustrated this variation.

RESEARCH METHOD

A link to the survey appeared on the students’ home page of the course management system, inviting medical students to respond. The survey followed the midterm examinations, when students might be inclined to reflect on their study strategies.

The survey asked students to identify their “most valuable learning strategies.” The responses on peer-learning were extracted for this paper. The final question invited students to, “add further comments about your preferred learning strategies.”

The ten questions (see Appendix) took the form of checklists of options. The options directed students’ attention to strategies and resources that were available to them, and students could check as many options as they wished. Several senior students were asked to review the survey before it was posted and their suggestions were incorporated.

The questions identified three types of peer-learning: SI; informal/private study groups; and study-buddies. Students were asked whether they thought these strategies were useful before lectures, after lectures, for revision, for exploring

learning resources such as the textbook, and for developing understanding, recall and motivation.

The survey targeted learning strategies rather than learning styles. That is, the purpose was to identify the strategies that students perceived as most effective, rather than their combinations of strategies. An investigation of learning styles would require a large population of learners.

SI usually targets difficult (at-risk) courses. However, this survey did not differentiate between courses, because all basic science courses in the MD program last one semester, are demanding, and are served by SI.

RESULTS OF THE SURVEY

202 students completed the survey. A further four responded to parts. This was out of a potential population of approximately 1600 medical students (13% response rate).

In response to the final (comments) question, three students explained that peer-learning did not suit their learning styles, e.g. "I do not like to work with peers very much and usually only end up becoming discouraged when I do. There are some people who work effectively on their own and professors/advisors/other peers need to realize this."

The responses to question 1 indicated that few students preview lectures in groups.

Question 2 revealed that only 4% of students believe it important for lecturers to know what is happening in SI sessions. This reflects the SI strategy that students determine the agenda.

Question 3 showed that approximately 10% of the respondents found it helpful to discuss their lecture notes with an SI group. 18% would discuss notes with their private study group, and 6% compared their notes with those of other students.

For developing understanding (question 4), 18% said it was useful to discuss topics in SI. 30% discussed with a private study group. 42% tried to explain the material to someone else, and 40% discussed with a study-buddy.

Question 5 showed that if students needed to approach someone for help with understanding, 23% would use an SI group. 31% would choose their private study group and 75% would ask their study-buddy or a classmate.

Question 6 enquired about strategies for memorizing. 11% said that revising topics in an SI group was effective. 18% selected revision with a private study group, and 24% chose a study-buddy.

3% of respondents to question 7 thought that an SI group was an effective place to study the textbook. 6% discussed textbooks with their private study group, and 7% chose a study-buddy.

To question 8, only 2% said they would use lecture recordings to clarify parts of a lecture in an SI group. 7% said they would consult the recordings in a private study group, and 8% said they would use recordings with their study-buddy.

When preparing for exams (question 9), 18% would discuss practice questions with their SI group, 20% with their private study group, 31% with their study-buddy, and 25% said they and their study-buddy quiz one another.

Question 10 asked whether they find it effective to use peer groups to motivate themselves, keep focused and work hard. 19% of students said SI groups were effective. 16% selected private study groups, and 25% chose a study-buddy.

DISCUSSION

If the response to the survey was representative, it revealed that approximately one in five students attend SI. In view of the strengths of medical students, who have been through a rigorous selection process, this ratio seems correct. The Department of Educational Services (DES) regards courses with a historical failure rate of more than 10% as “at-risk.”

More students indicated that they believed private study groups and study-buddies were effective for learning than the number who endorsed SI. The strongest uses of SI were for developing understanding (question 4), for finding help when they could not understand something (question 5), for preparing for exams (question 9), and for keeping themselves motivated, focused and working hard (question 10). Approximately 20% of students in the Medical School consider that SI is effective for these four purposes.

Few students considered SI effective for preparing for lectures, memorizing, use of textbooks, and viewing (or reviewing) recordings of lectures. The value of SI groups for these tasks is perhaps not obvious to students, but SI Leaders could ask groups how they might increase their capacity for learning.

The survey showed that few students recognized the value of lecture recordings for peer-learning. This may be for logistical reasons, but the technology enables students to select any PowerPoint slide and move directly to that stage of the lecture. This makes it time-efficient. In the words of one respondent to the survey, “...recordings are simply the best studying tool that has happened to lectures since the chalk board. It is not only for when you can't go to class but allows you to go to class without having to be in a note-taking panic. It allows you to sit in lectures and pay attention instead of worrying about writing everything down. I find that going over the (recorded) lectures after school, when I can pause the presentation in order to look something up in the book or my notes, helps tremendously.”

A disadvantage of lecture recordings is their impact on class attendance. Students might use the technology as their primary delivery system (against the School's advice). Typically, it takes students much longer to watch a recording of a lecture than to attend live, so there is the danger that they will fall behind. This may negatively impact their attendance of SI.

The survey illuminated the important role that peer-learning plays in the medical school. Seventy five percent of students said they approach their study buddy or a classmate for help when they do not understand something. By comparison, 44% said they approach the professor. This is not to say that the professor would be less helpful, but, for whatever reason (e.g. convenience, approachability), more students use a peer than a professor.

Further evidence of the value of peer-learning was that 41% said they found it helpful to explain a section to someone else, 38% said it was helpful to discuss topics with a study-buddy, and 31% said they use a study-buddy when preparing for exams. Thus, there is a strong culture of peer-learning in the school, which might be in part a by-product of the established SI program.

CONCLUSION

These findings highlight the importance of the lecturer and SI Leader for developing students' knowledge of effective study strategies. Students need to appropriate skills for using new teaching-learning technologies, otherwise they rely on what has worked for them in the past.

Private study groups and study-buddies have advantages. Besides enjoying greater freedom than SI, private groups can become cohesive if they observe ground rules. Some develop capacity by delegating preparation to members, and a condition of membership is that each one contributes. Therefore, demands of private groups may be stronger than those of SI.

In addition to the formal structure and quality control of SI programs, a distinctive advantage is the SI leader. As a successful near-peer, the leader is trained to elicit analysis of the work, and facilitate the development of understanding through focused discussion. SI Leaders have a sense of the goals of discussions, and keep the group on track. Therefore, SI leaders can serve as change agents by facilitating reflective evaluation of learning technologies. These include note-making, diagrams, answering questions, time management, memorizing, textbooks, lecture recordings, library, the web, and techniques from PBL.

SI Leaders realize the potential of their role through on-going training, mentoring and quality control. Besides contractual SI training workshops and student evaluation procedures, lecturers can strategize with SI Leaders about how to enhance the quality of learning in the course (the feedback loop).

It is important for SI leaders and lecturers to strategize about integrating technologies into the teaching-learning culture of the course. Without a team-based approach, valuable learning technologies may be overlooked or used inappropriately.

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APPENDIX

Survey items specific to peer-learning

1. What are your most valuable strategies for preparing for lectures?
 - I discuss the next lecture with my SI Group.
 - I discuss the next lecture with my informal/private study group.
2. Which characteristics of lecturers are most helpful for promoting learning? (30 characteristics listed)
 - The lecturer is aware of activities in the SI Groups.
3. Which strategies are most valuable for making notes?
 - Discuss lecture notes in a SI Group.
 - Discuss lecture notes in your informal/private study group.
 - Compare your notes with those of other students.
4. Which strategies are most valuable for developing understanding?
 - Discuss topics in a SI Group.
 - Discuss topics in your informal/private study group.
 - Try to explain the section to someone else.
 - Discuss the topic with a friend (study-buddy).
5. Whom do you approach for help when you cannot understand something?
 - A SI Group.
 - My informal/private study group.
 - My study-buddy, or another classmate.
6. What are your most valuable strategies for memorizing?
 - I revise topics in a SI Group.
 - I revise topics in my informal/private study group.
 - I learn, then ask a friend/study-buddy to quiz me.
7. What are your most valuable strategies for using your textbook?
 - I discuss the textbook with my SI group(s).
 - I discuss the textbook with my informal/private study group.
 - I discuss the textbook with my study-buddy.
8. When do you view recordings of lectures (Sonic Foundry)?
 - When I want to clarify part of a lecture with a SI Group.
 - When I want to clarify part of a lecture with my informal/private study group.

- When I want to clarify part of a lecture with my study-buddy.
9. What are your most valuable strategies for preparing for exams?
- I discuss practice questions with my SI Group(s).
 - I discuss practice questions with my informal/private study group.
 - I discuss practice questions with my study-buddy.
 - My study-buddy and I quiz one another.
10. What are your most effective strategies to motivate yourself, keep focused and work hard?
- I join SI Groups.
 - I join an informal/private study group.
 - I find a study-buddy.