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Students' procedures for reviewing lecture notes

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Teacher education students were questioned about the purposes they established for use of lecture notes and their use of lecture notes was observed following the presentation of a short lecture. The students also completed a test on the lecture material. The purposes students established for their lecture notes covered a wide range of study and practical tasks. Notes were reported to be most commonly used for essay writing, which was the most common form of assessment for these students. The most frequent strategy students used for reviewing of lecture notes was some form of repetition. Less common was the use of complex elaborative procedures that involved generation of links among different components of the lecture notes, or between the new material and the students' existing knowledge. Concerns are raised about the state of the students' metacognitive knowledge about lecture-note review and about the need to include such knowledge in university courses.

notetaking; lectures; lecture review; metacognitive knowledge

INTRODUCTION

Lectures remain a commonly used mode of instruction in higher education and at these lectures many of the students attending take notes on the content of the lectures. What then do the students do with these notes? It was this question that was the central focus of this project. We set out to find out how students who were studying in the field of education used the notes that they took in lectures and examined how the range of different uses of lecture notes varied in degree of elaboration. Our concern with elaboration arose from our view that the effectiveness of elaboration of information during study has a powerful influence on the storage and later use of that information.

Lectures are seen to be an efficient and flexible form of teaching that can inform students and arouse their interest in a given topic (e.g., Barbetta & Skaruppa, 1995, Barry, 1995). In these lectures lecturers expect students to take notes and students expect to take notes in lectures. Despite possibly different reasons for note-taking, most students take notes from almost every lecture (Carrier, Williams & Dalgaard, 1988; Hartley & Davies, 1978; Palmatier & Bennet, 1974). The two most common reasons for note-taking proffered by students are the usefulness of note-taking for learning and social pressure.

Hartley and Davies (1978) suggested that social pressure to take notes, from both lecturers and other students, could be associated with the need to provide "evidence of effort invested". They also noted that American students valued note-taking far more than English students and reported more social pressure than English students. It can be expected that, for students in some countries where the lecture is the most important method of teaching in higher education and notes taken from lectures are the most important resources for learning, the degree of social pressure would be very high.

There is substantial research support for the view that note-taking assists students' learning (e.g Annis & Davis, 1975; Crawford, 1925; DiVesta & Gray, 1972; Barnett, DiVesta & Rogozinski, 1981; Kardash & Kroeker, 1989). The effect on learning is argued to emerge during both encoding and storage stages of processing. The encoding effect is proposed to result from the process of attending to and recording important details of the lecture material. The storage effect is argued to be the result of the reviewing of notes and the combined effect of encoding and storage processing has been shown to be more beneficial than encoding on its own (Hartley, 1983; Kiewra, 1985d; Kiewra, Dubois, Christian, McShane, Meyerhoffer & Roskelley, 1991; Kiewra, Benton, Kina, Risch & Christensen, 1995; Peper & Mayer, 1978, 1986)

We also know that, in general terms, it is a good idea for students to review their notes. Effective review of notes taken in lectures will usually provide students with an advantage when they later undertake a related academic task such as a test. In many cases students will have access to both their own notes and those from the lecturer. Kiewra and his colleagues (Kiewra, 1983, 1985a, 1985b, 1985c; Kiewra & Dubois, 1988) found that reviewing the lecturer's notes had a greater effect on learning than reviewing students' own notes, although achieved the best performance when they reviewed both the lecturer's notes and their own notes (Kiewra, 1985a).

The form of the review used by the student is important. Peper and Mayer (1978, 1986) argued that the generative nature of processing of lecture material influences subsequent use of the lecture material. Other researchers have shown that the writing of summaries or the posing and answering of questions about the lecture material have powerful effects on subsequent use of lecture material in tests and other academic tasks (Hadwin, Kirby & Woodhouse, 1999; King, 1992). These sets of findings fit within the broad constructivist, self-regulatory perspective on student learning. The active, strategic organisation of lecture material by the student is argued to result in powerful knowledge representations that can be accessed in later problem solving. In reviewing their notes students have the opportunity to generate connections between knowledge components, either connections with prior knowledge, or with subsequent study material, or among parts of the lecture material. (Kiewra, Dubois, Christian, McShane, Meyerhoffer & Roskelley, 1991; King, 1992; Schunk & Ertmer, 1999; Winne 1995).

This is the theory that is available for use by lecturers in designing and delivering their lectures and for use by students in taking and reviewing their lecture notes. The broad objective of the current study was to see to what extent this public theory of note-taking and subsequent use of notes is also the private theory of a group of education students.

Van Meter, Yokoi & Pressley (1994, p.333) noted that "At present, we know very little about how students process their notes when they review." However, researchers have gathered some information from students about note-taking. Hartley and Davies(1978) and Van Meter et al.(1994) reported that students saw the usefulness of note-taking in maintaining their attention to the lecture. Students in the study of notetaking by Pressley, Van Etten, Yokoi, Freebern, and Van Meter. (1998) reported that the taking of notes was important for their test preparation and homework. In this research students also noted that note-taking activity facilitates comprehension and organisation of the lecture, either by helping them to recognise the structure of lecture material during the lecture or by helping them to restructure it after the lecture. Students also regarded note-taking as providing them with material for revision and referencing (Hartley & Davies, 1978; Van Meter et al., 1994).

The studies by Van Meter et al. (1994) and Pressley at al. (1998) were principally studies of note-taking practices. Students distinguished between lectures that were easy-to-note and those that were made difficult to note by such factors as lecturing style, pace of presentation, quality of explanation and organisation. Students also reported varying their note-taking styles according to their prior knowledge, lecturer style, experience

The current study is focussed on students' use of their lecture notes and was designed to provide further knowledge about the processes students use to review their notes. In seeking student explanations for their views we also aimed to gather information about what Van Meter et al, (1994) describe as the students' theory of note-taking, or their theory of use of notes. Specifically the current study was designed to provide information on the following issues:

1. The purposes established by students for lecture notes.

2. The use made of notes and the reasons for this use.

3. The strategies seen to be most effective for reviewing notes, and why these strategies were regarded as effective.

In seeking this information were aiming to provide information about the degree of match between the students' theories of note-taking and use of notes and the account generated in the self-regulatory approach to learning in higher education.

METHOD

Participants

The study reported here formed part of a larger study. In the initial part of the study there were 55 students in the final years of a 4 year education program that attracted both undergraduate and postgraduate entry. Twenty-nine students were in the third year of their program. For the final parts of the study a subset of 18 of these students provided data. This group of students were the ones from the larger group who had not received any specific strategy training during the larger study.

Procedure

Students took part in four different activities. First they completed a questionnaire which asked them to describe what they did with their notes after a lecture. They then watched an 18 minute videotaped lecture on theories of forgetting and took notes in any way they wished, knowing that there would be a short-answer recall test at the end of the session. Following completion of the lecture the smaller subgroup of 18 students read a short article on hypnosis. This was a filler activity designed to provide a short period of alternative activity. After this the students were asked to review their lecture notes and also had access to a lecture outline.

Students then completed a second questionnaire that focussed on the procedures they used for reviewing notes. Questionnaire 2 consisted of two open questions. In the first question, students were asked to describe all the review procedures they used when they reviewed their notes from the lecture on forgetting. The second question asked them to indicate the review procedure they found most effective for their learning and to explain the way this effective procedure would help their learning. A recall test on lecture content was completed after this.

In Questionnaire 3 students were asked to select from a list the three lecture-note review strategies those strategies they regarded as most useful for learning, and the three they regarded as least useful. They were also asked to explain the reasons for these selections.

Coding of responses

The responses to all questionnaires were coded using the same broad procedure. Codes were generated from an analysis of the constructs of elaboration and complexity used in the literature of instructional psychology (e.g. Anderson, 2000; Pressley and McCormick, 1995). The focus in this case was to generate categories that differed in degree of elaboration or complexity. Code definitions were first discussed and definitions agreed upon by two raters. These definitions were then used in a first coding of questionnaire responses by one of the raters. Any difficulties in definition or coding of specific responses were then discussed by

both raters and modifications to the coding scheme agreed upon. A second coding was then carried out by one rater, with a reliability check being done on a small sample by the second rater. The final rating was not undertaken until both raters resolved differences in rating of specific cases.

Analysis of responses in Questionnaire 1

Responses to Questionnaire 1 were separated into those that indicated a *purpose* for use of lecture notes and those that described a *strategy* that the student used with the notes. Three major categories of purposes were reported; namely purposes related to specific academic tasks, purposes for general learning, and purposes related to career. More specific groupings within these three categories were also identified. In the categorising of statements about strategies for using lecture notes, the responses were grouped into nine different types of strategy; namely filing, seeking of reference, repetition, highlighting, sounding, simple elaboration, complex elaboration, selection and monitoring. A definition and an example of each strategy is shown in Appendix 1.

Analysis of responses in Questionnaire 2

Questionnaire 2 collected information about students' actual activities engaged in while reviewing their notes from the lecture. Therefore, information obtained from Questionnaire 2 related to a specific situation rather than to the general use of lecture notes considered in Questionnaire 1. Three parts of students' answers were identified; the strategies actually used for reviewing lecture notes, the strategies nominated as most effective strategies for review, and the explanations given for effectiveness of these strategies.

The strategies used for reviewing notes made during the lecture on forgetting were coded using the approach developed for analyzing responses from Questionnaire 1. A strategy was coded as effective when it was reported by students as effective for review, or when it could be inferred as an effective activity from the answer. In their answers, some students wrote explicitly that the strategy was "the most effective" or "the most useful" for them. In other cases, effective strategies could be identified from a "cause and effect" structure in students' descriptions. If the activity was considered as "cause", it was coded as an effective strategy. On the contrary, if the activity was considered as "effect", it was coded as a reason for the effectiveness of review strategies. For example, in the answer "*Forming a picture. If I have a picture in my head I can relate it to specific circumstances*" "forming picture" and "have a picture" were seen as a "cause" and "can relate it to specific circumstances" as an "effect". Therefore, the former was included in the group of effective strategies and was coded as *visualising*, and the later was coded as a reason for effectiveness, in this case *linking*. The labels, definitions and examples of each category of effective strategies are included in Appendix 2. The analysis of students' reasons for the effectiveness of strategies will be introduced with the analysis of the Questionnaire 3 below.

Ratings of complexity

In both Questionnaire 1 and Questionnaire 2 strategies were rated as involving *simple* elaboration or clarification when they did not make any change to the content of lecture notes. These strategies were for example, repetition, sounding or triggering memory. Simple strategies received the complexity score of 1. Strategy descriptions that involved transformation of content in the lecture notes were divided into two categories depending on the degree of change that could result from use of the strategy. In the *less complex* category, strategies did not involve either change to connections within concepts, or change to the relationship between new information and student's prior knowledge. Strategies in this less complex strategies were for example, expanding notes, visualising and making simple interpretations or clarifications. These strategies were given a score of 2 for complexity.

Any strategy that involved a change in connections within concepts of the lecture and/or between new information and student's existing knowledge was placed into *more complex* strategy group. These strategies were, for example, complex clarification, organisation, paraphrasing, summarising, selecting, linking, or explaining. All of these strategies were given a score of 3 for complexity.

Analysis of responses related to reasons for effectiveness and usefulness of strategies

Reasons for the usefulness of review strategies were obtained from students' explanations for their choice of a useful strategy in Questionnaire 3 using the same process as that used for the reasons for effective strategies. Reasons for the effectiveness and the usefulness of review strategies were coded using the categories and definitions presented in Appendix 1. The procedure used to rate was the same as that used for rating the strategy descriptions given in this questionnaire as described above. The complexity score of each student was the total score for all reasons reported.

The categorising of explanations why specific review strategies were regarded by students as being *not* useful for study purposes followed the logic used in categorising of responses from the other questionnaires. Categories were established to recognise different degrees of transformation of note content, using the simple, less-complex, and more-complex categories used previously. The remaining categories emerging in this analysis were of a different nature to those that had been identified in previous analyses, being concerned with social and efficiency concerns. The categories used in this analysis are shown in Appendix 4.

RESULTS

Purposes described by students for using lecture notes

The focus of interest here is the purposes that students saw for using notes after lectures. While other research has been concerned with students' purposes for note-taking in general (Hartley & Davies, 1978; Isaacs, 1994; Van Meter et al., 1994), this study focused more specifically on the purposes that students suggest for using notes after lectures.

Three main groups of purposes of using notes were identified, namely "specific purposes for learning", "purposes related to career" and "purposes for general learning". Details of the type of purpose and the percentage of each reported purpose in relation to the total number of reported purpose answers are presented in Table 1.

Over half of the purposes identified by students were those concerned with specific academic tasks, such as essay writing and exam preparation. A smaller percentage of responses indicated that notes could be used in preparation of tutorials and seminars. One third of the responses focused on more general learning purposes such as future study or understanding and a small number of expressed purposes (6%) were related to students' practical teaching.

The use of lecture notes for writing essays was the most common single purpose seen for lecture notes, representing 32% of responses. Lecture notes could be used as a guide for essay writing in planning, organising or as a checklist which helped students "*make sure I have not forgotten to cover something important*". Lecture notes could also provide students with information, key points, and statements that could be quoted in an essay. Lecture notes were seen to be useful for general preparation for exams and as materials for revision before the exams. This result is consistent with data obtained from the Van Meter et al.'s (1994) study. Lecture notes could also help students to "*prepare for talks/ presentations*", to "*respond to questions in workshops*" or to "*recheck details/ information*". The low frequency of response about using notes for tutorials and seminar preparation might indicate that many students do not draw explicit links between their lecture and tutorial/seminar classes.

Table 1. Purposes for using lecture notes

Specific academic tasks (56%)	Essay writing (32%)	General use for writing essays (9%)	
		Reference for writing (8%)	
		As guide for writing (6%)	General guidance (3.5%)
			For process of writing (1.5%)
			As a checklist (1%)
		Information provision (6%)	Key ideas (4.5%)
			General information (1.5%)
		Quote (3%)	
	Exam preparation (15%)	Revision for exams (9%)	
		General preparation (6%)	
	Tutorials and seminars (9%)		
General learning purposes (38%)	Future study (21.5%)	References (12.5%)	
		Next lectures (3.5%)	
		Other subject (3.5%)	
		Further study (2%)	
	Understanding (5.5%)	Clarification (3.5%)	
		Overview of a topic (1%)	
		General understanding (1%)	
	Memory jogger (4.5%)		
	Monitoring (3.5%)		
	Revision (3%)		
Purposes related to career (6%)	Teaching practice (3%)		
	Working in school (3%)		

The high frequency of reported use of notes for essay writing may well be associated with the high frequency of using essays as a method of assessment in the department where the students are studying. The students in this study were enrolled in a faculty where most of their assessment, though not all, was based on a combination of written assignments and examinations.

Consistent with the findings of Hartley and Davies' (1978) and Isaacs (1994), students in this study reported the use of notes for further study. Future study could be to *"use sources cited as a basis for further reading"*, *"preparing for next lectures"*, *"use in other subjects"* or *"as a basis for further development of lecture material"*. Lecture notes could be used to help students in understanding and remembering lecture materials and for monitoring learning, suggested by views such as "*Notes are used to clarify any misunderstanding that I might have about a subject*" and "*as a prompt to recall information learned in lecture"*.

The students' field of study obviously plays an important role in the purposes of using lecture notes. As the students in this study were student teachers, there were a small number of reports that lecture notes were used for teaching practice or for working in school. These referred to instances where they "*use notes as a basis or for ideas when planning lessons for teaching practices*" or use notes "*when writing curriculum for a class*".

In summary, most students did report that notes were used after the lecture. The emphasis in the purposes reported may reflect the interaction between the method of learning and assessment in the students' degree program. Although the findings generated from Questionnaire 1 show a similar general pattern to those obtained from previous studies, they

do provide more specific information about students' purposes for using notes after lectures. The results show that the student group made some reasonably fine discriminations among uses for lecture notes, though most of the categories of use were still rather general. It was the nature of the categories that was the focus of the next analysis.

Types of strategies reported by students for review of their lecture notes

The interest of this part is the nature of the procedures adopted by students for using notes during study. The analysis of the students' reports on these procedures was designed to see to what extent the procedures involved substantial transformation of lecture notes that might is associated with more elaborate, or deep, learning (Pressley and McCormick, 1995). The types of procedures and the number of students reporting use of each are presented in Table 2. The definitions used in making decisions about grouping of these strategies are shown in Appendix 1.

Table 2. Frequency of use of different type of review strategy

Type of procedure	Number of students reporting use (n=55)
Filing	12
Reference	24
Repetition	42
Highlighting	5
Selection	6
Rhyming	2
Monitoring	1
Simple elaboration	10
Complex elaboration	16

Of the 55 students, 12 reported that they usually filed lecture notes for future use. This strategy was reported as simple filing, such *as "filing away without doing any thing else."* Almost a half of the students reported that they used their lecture notes as a source of references for essay writing, for seminar presentations, or for tutorials. It also indicates that students looked to lectures as an important source of information for further study. We are not able to say from this study how this use for referencing compares with the use of other sources such as set readings or library research. The findings here are consistent with results obtained from Hartley and Davies (1978).

Repetition was by far the most common procedure reported by students. Forty-two of the 55 students reported activities such as rereading or rewriting, a pattern consistent with the findings in Van Meter et al.'s (1994) study, and those of Kardash and Kroeker (1989) who reported that rereading was the most popular review strategy that was reported by students. The emphasis on repetition in reviewing lecture notes is consistent with a wide use of this type of strategies in second-language vocabulary learning reported by Lawson and Hogben (1996).

Small numbers of students reported that they selected particular parts of notes for attention through use of procedures such as highlighting or underlining to identify "*major areas*", or "*key points*". Two students reported use of rhymes to help them in memorising and only one student reported using notes to monitor understanding .

Twenty five students reported some form of elaboration of lecture note material. Simple elaboration involved activities such as "*expanding lecture notes*", "*visualising*", "*ordering*" or "*making simple clarifications*", which made only simple changes or additions to the lecture notes. The complex elaboration procedures, such as " *outlining*", "*evaluation*", "*concept mapping*", "*linking*", "*paraphrasing*" and "*summarising*" would have greater potential to result in the generation of more connections among ideas in the lecture material, or between

that material and students' prior knowledge. This latter activity would be predicted to be of more use for subsequent complex problem solving.

The pattern of results in Table 2 suggests most of these final year students reported more frequent use of such simple strategies as repetition than of more complex strategies such as elaboration. Although elaboration is believed to be a more effective learning strategy for longer term retention of information than repetition, many of the students in this study did not report use of the more complex procedures when reviewing their notes. Spontaneous use of elaborative strategies has not been reported by many of the students in either the current study or in other research (e.g., Pressley, Wood, Woloshyn, Martin, King & Menke, 1992). As noted earlier it seems likely that the strategies adopted for use of notes will be influenced by the types of learning and assessment activities established for students by their lecturers. This should be an area for further investigation.

Number of strategies reported by each student

We were also interested in the number of types of strategies mentioned by each student. The number of strategies mentioned by each student ranged from none to six. Two students did not report use of any strategy. Most reported use of two strategies (24), with 12 students reporting use of a single strategy and 13 reporting use of 3 strategies. Four students reported use of four or more strategies. When the complexity of strategies reported in Table 2 was rated, there was a strong correlation between the number of strategies reported and strategy complexity ($r = .93$, $p < 0.01$). This result suggests that the greater number of strategies used by students, the more likely they were to include complex strategies.

Review strategies used with notes from the lecture on forgetting

The focus in this part of the analysis is on what strategies students actually used to review lecture notes from a specific lecture on the topic of forgetting. These results came from the answers of the subgroup of 18 students who did not receive strategy training in the larger study. A point of interest with this data was that the complexity of the reported procedures could be related to the scores students obtained in the test following the lecture on forgetting. The data related to this question is shown in Table 3.

When compared with the pattern observed in the responses in Table 2, we again see that repetition was the most frequently reported strategy. However, in the case of this specific lecture, a higher percentage of students reported use of simple and complex elaboration strategies than was reported for the general situation in Questionnaire 1. In looking for reasons why there was greater use of elaboration in this part of the study we suggest that the availability of a detailed lecture outline may have encouraged more generative activity in students, even though this outline was organised in a linear manner. The work of Kiewra (1983) suggests that outline format can be a strong influence on the type of transformation of lecture material used by students. The complexity of the reported strategies was again rated and there was a moderate correlation between the test score obtained by students and the complexity of strategies used for reviewing lecture notes, ($r=0.51$, $p < 0.05$.) The more complex the strategies students used for reviewing of lecture notes, the better they performed on the test.

Strategies considered as effective

In the final section of the analysis of information gathered in this study we were interested in the students' reasoning about the strategies they employed when using lecture notes. This information might be seen as giving us a glimpse of the students *theories* about use of their lecture notes. The question related to this purpose asked students to identify the strategies they regarded as being most effective for reviewing of the notes they took during the lecture on forgetting. The results are shown in Table 4.

*Table 3. Frequency of use of different type of review
procedure for lecture on forgetting*

Categories of strategies	Number of students reporting use (n=18)
Repetition	11
Highlighting	3
Selection	5
Rhyming	4
Expanding notes	5
Simple elaboration	7
Complex elaboration	7

The responses follow a similar pattern to that observed in the students' reports of the strategies they used during this lecture and support the usefulness of those reports. Simple strategies regarded as effective involved use of the lecture handout or of the students' own notes for activities such as self-testing, reading aloud, highlighting and repetition. Students also reported that simple elaboration strategies such as expanding notes, adding keywords or examples, visualising, interpretation and simple clarification were effective. A smaller percentage of the students identified more complex elaboration as being effective. These activities included activities such as organisation, linking of ideas and the development of explanations for points noted from the lecture.

Table 4. Frequency of effective strategies reports

Effective strategies	Number of students (n= 18)
Repetition	10
Other simple strategies	4
Simple elaboration	7
Complex elaboration	5

Reasons given for why review strategies were effective or useful

We were interested in the reasons students provided for the effectiveness and usefulness of review strategies. The results for this analysis came from Questionnaires 2 and 3.

The students' reasoning about strategy effectiveness and usefulness was assumed to be based upon their understanding of the procedures that would result in good quality learning. It is this understanding that we refer to as comprising the students' theories of learning.

Reasons for effectiveness or usefulness were categorised into three main groups, namely, simple reasons, less complex reasons and more complex reasons. Categories of reasons and the number of students giving each reason are shown in Table 5. The number in parenthesis in each cell is the total number of responses in that cell.

Strategies such as memory triggering and repetition were seen to be effective because they addressed both cognitive and affective needs of students. These procedures could provide cues for recall and focus attention, both useful cognitive actions. They could also increase the level of confidence of the student and assist with referencing in subsequent work. However, these *simple reasons* did not involve any change of the learning materials.

Seven types of *less complex reasons* were identified, all of which related to some simple changes in the learning materials. In this group of reasons, an undifferentiated understanding was the most common reason given for the usefulness of a strategy. Moreover, as simple clarification, simple personalising and interpretation could result in a better understanding, they supported the students' strong need for understanding. What is not apparent in this group of

reasons is a concern for generating interaction among the different components of a set of notes.

*Table 5. Frequency of reason categories for strategy effectiveness (Q2)
and strategy usefulness (Q3)*

Reasons	Reasons	Effectiveness(Q2)	Usefulness(Q3)
	Repetition	4	2
	Memory trigger	4	1
	Attention	2	1
Simple reasons	Sounding	1	1
	Confident	1	
	Referencing		1
	More time for learning		1
	(Subtotal)	(12)	(7)
	Understanding	1	5
	Simple clarification	1	1
Less complex	Visualising	3	2
reasons	Simplifying		1
	Simple personalising		1
	Interpretation		1
	(Subtotal)	(5)	(11)
	Selecting		1
	Paraphrasing	1	1
More complex	Linking	3	4
reasons	Organisation	2	2
	Summarising		1
	Explaining		1
	Placing in context		1
	(Subtotal)	(6)	(10)

This generative, or interactional, activity was the focus of the *more complex reason* group. The reasons advanced in this group focused more on bringing about interactions between students' prior knowledge and new lecture information, or interaction within components of the lecture materials. As was the case in earlier analysis, there was less frequent discussion of the more complex elaborative strategies than of simpler features of learning.

There was a difference in the pattern of response to the effectiveness and usefulness questions. Most prominent is the increase in the frequency of nomination of elaborative activities as being useful for learning. It is important to remember here that in making the judgements about usefulness students were making choices among a list of provided strategies, rather than generating their own justifications. The list of options seems to have reminded them of alternatives that were not as readily accessed when they were responding without such reminders.

A comparison of the pattern of responses shown in Tables 2 and 3, and those in Table 5, raises the possibility of a difference between students' theories and their practice. In the earlier tables we saw that most of the students reported use of repetition, either in general or after the lecture on forgetting in this study. A lower percentage of students focussed on use of elaboration in those reports. Yet, in Table 5 the frequency of more complex reasons is quite similar to that of similar reasons, especially in the responses to Questionnaire 3. Within the limits of the current study we cannot resolve this possible inconsistency between students' practice and their reasoning about review strategies and it does seem to be a fruitful area for further investigation.

We rated the complexity of the students' reasons for usefulness of strategies and correlated these ratings with their scores on the final test There was a significant moderate positive correlation between the final total test score and the complexity score of reasons for usefulness ($r= 0.56$, $p< 0.05$).

Why do students regard strategies as not useful for learning?

The final set of information coming from Questionnaire 3 referred to students' reasons for regarding review strategies as not being useful for their learning. As was the case for their decisions about usefulness of a strategy, students were asked to explain why they regarded a nominated strategy as not being useful. Categories of reasons for why review strategies were not seen to be useful and the number of students answering in each category are shown in Table 6. Not all students were able to, or chose to, respond to this question.

As can be seen from Table 6, the reasons given here were varied and mostly of low frequency. However, they do provide some different information about students' reasoning than was available from responses to other questions. Two responses referred to the social context of study that had not been mentioned previously. One student stated that "*I think I am a social learner, therefore doing all the thinking in my head doesn't allow me to learn as effectively as talking about it out aloud does*".

Efficiency factors were is the largest group of reasons for the non-usefulness of review strategies. A review strategy was not useful if a student's time and effort were used inappropriately because the strategy "*requires too much effort and time*". In addition to time and effort, students were concerned about the amount of to-be-learned information. Review strategies, although they were proved effective in learning, were still not useful if they increased the amount of the to-be-learned information. For example, one student found review by associating each main idea with a letter or object and memorising the list of letters/ objects was not useful because "*by adding symbols etc. it adds to more information that you have to remember*". In a similar way one student rejected a review strategy because it increased the difficulty of the review process. Adding symbols when reviewing notes was not useful because "*symbols can ... become confusing, especially when under pressure in an exam*".

Only two of the responses referred explicitly to reasons associated with complex processing of the lecture material. One student stated that: "*I find rote learning difficult because it removes the context from the information. It strips the information of any triggers to assist in recalling at a later date.*"

Table 6. Frequency of category use given by students for why strategies are not useful

Reasons		Number of answers
Social reasons	Lack of social context	2
	Time consuming	1
	Effort consuming	1
Efficiency reasons	More information to learn	2
	Not relevant	1
	Redundancy	1
Difficulty reasons	Confusing	1
Simple reasons	Forgetting the letters	1
	Misplace material	1
	Only repetition	1
Less complex reasons	No understanding	1
More complex reasons	No link	1
	Removes context	1

One implication of this admittedly small set of responses to this final question is that they serve as a reminder that strategy knowledge is not just cognitive - it also has an affective component. Students will not use what might be a powerful strategy if they do not like using it.

CONCLUSION

Pressley at al. (1998) describe this area of research appropriately by referring to it as "*the metacognition of college studentship.*" The knowledge about notetaking that students take with them to lectures and to the use of their notes after lectures is functionally important. It is this knowledge that guides their use of the notes they take and it is the outcome of use of this knowledge that will influence their subsequent problem solving on the topic of the lecture. The results of our analysis add to our knowledge about the 'theories' that students have constructed in this area of university studentship.

Students report use of notes for a wide variety of tasks in both their subsequent study activities and in their practical work as teachers. In the group of students involved in this project lecture notes provided a major resource for support of the essay writing that formed the bulk of their assessment tasks.

Of more interest in this study was the way in which students used their notes and it is the results of this analysis that is of most relevance for the research on the metacognition of studentship. Repetition of material in notes was the most frequently reported strategy for both lectures in general and for the short lecture that formed part of this study. Less frequently reported was the use of strategies that involved complex elaboration of the lecture material. We regard this pattern of results as indicating an area of concern for lecturers and students. Of course the degree of concern that is appropriate here is dependent on the requirements established for the use of lecture material in the assessment tasks that form part of the student's course or program.

Here, let us focus on assessment tasks that require a deep understanding of the lecture material. For these tasks we can reasonably argue that the student will need to be engaging in complex elaboration of much of the material included in lecture notes. This will be the case wherever the assessment task requires some extension of what has been learned in lectures, or when it involves some novel perspective needs to be adopted on the lecture topic, or where far-transfer problems must be solved. In all of these cases the student would be predicted to benefit from complex transformation of the lecture notes. The correlational analyses in this study relating review strategy and test score support this view.

An issue of concern for lecturers in our findings is the range of knowledge that students have about effective uses of lecture notes. In our data, those students who used more strategies also were more inclined to know about and use more complex elaboration strategies, which was positively associated with higher test score. Yet not all our students reported that they typically used complex elaboration strategies or reported use of them when they would have been useful in this study. This raises a question about whether students know as much as they need to about such strategies. If our answer to this question is in the negative we then need to consider whether we should be teaching students such strategies as part of our courses. We are inclined to answer in the positive to this last question.

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APPENDIX 1:
DEFINITIONS AND EXAMPLES OF STRATEGY CATEGORIES IN QUESTIONNAIRE 1

Category	Definition	Example
Filing	Storing lecture notes	File with other lecture notes.
Reference	Getting information from lecture notes	Look up names of authors or readings mentioned by the lecturer.
Repetition	Accessing lecture notes at least once more after the lecture.	Reread, or rewriting, the notes taken from lectures.
High-lighting	Emphasising parts of lecture notes	Underline key words, ideas in lecture notes.
Sounding	Making parts of lecture notes become auditory	I make up rhymes with the notes gathered.
Simple elaboration	Changing lecture note content in simple ways, without establishing new relationships.	Expand notes into sentences/ paragraphs for easier use, reordering, or clarifying.
Complex elaboration	Changing connections within lecture notes or between prior and new knowledge.	Write up in a summary of lecture notes, or mind mapping.
Selection	Distinguishing main ideas from less important ones	Pick out most important and relevant points...
Monitoring	Monitoring understanding or learning activities	For exams I look, cover, check.

APPENDIX 2:
STRATEGIES REGARDED AS EFFECTIVE FOR REVIEW

Strategy	Definition	Example
Repetition	Accessing lecture notes at least once more	Writing the information out several times helps me learn effectively.
Triggering memory	Helping students to "trigger" or "jog" their memory	Using notes to trigger memory of actual event in video.
Sounding	Making lecture content become auditory.	Saying it over in my head helps.
Expanding notes	Adding information to lecture notes	Writing the additional notes from the sheet and adding these to my notes was most useful…
Visualising	Making lecture notes visual or forming picture	Visualisation helps me bring relevance and a humanistic approach to my study.
Interpretation	Adding interpretation to lecture notes	I think that adding my own interpretation of what was in lectures helps me learn most effectively
Simple clarification	Making clarification in simple ways, without changing the structure of lecture notes	Clarification is essential in avoiding misconception.
Complex clarification	Making clarification which related to the change in the structure of lecture notes	Maybe the clarify one. (Try to give it more structure)
Paraphrasing	Restating, rephrasing lecture notes in own words	... put the words in my own way- paraphrasing help me to understand what is being said.
Selecting	Distinguishing main points from less important ones	Repeating main points to myself. (…) Get the important stuff memorised first.
Organisation	Changing the structure of the lecture notes.	Organisation of the information was important for me to help in my retention.
Linking	Relating, connecting points in lecture notes or between new and old knowledge	Trying to develop understanding and sometimes relate it to something.
Explaining	Giving explanations to concepts in lecture notes	I find explaining the concept to people helps me learn most effectively.

APPENDIX 3:
REASONS WHY REVIEW STRATEGIES WERE REGARDED AS
EFFECTIVE OR USEFUL

Category	Definition	Example
Repetition	Helps students access lecture notes at least once more after lectures	By rewriting my notes, I am going over the information again...
Memory trigger	Helps students to "trigger" or "jog" their memory	Visualisation helps me trigger memories and ideas on the subject
Attention	Helps students in paying attention to some parts of lecture notes	Rewriting notes causes me to focus on every points as I go through
Sounding	Helps students "hear" the lecture content better	I am good at remembering rhythmical patterns.
Confident	Using strategy makes students feel confident	If I feel sure that my interpretation is accurate I am more likely to feel confident in recall.
Referencing	Helps students to get information from lecture notes	... being able to find information in notes has proven adequate.
More time for learning	Helps students to have more time for leaning	Rewriting allows extra time to go over material slowly.
Understanding	Making students have a better understanding of lecture content	Often I rewrite notes several times and that also helps me to understand.
Simple clarification	Helping students clarify concepts	Talking with other people clarifies any inconsistencies...
Visualising	Helping students "see" the lecture material or build a mental picture of the notes	A mental picture of the notes is built up-ideas underlined or highlighted are visualised when recalled for test or assignment.
Simplifying	Helping students make complicated information more simple.	Examples can make complicated information more simple...
Simple personalising	Helping students make information become more suitable to themselves	I feel is important in that learning is most effective when it has personal relevance...
Interpretation	Helping students to interpret lecture notes	Talking with other people allows me to explain my interpretation.
Selecting	Helping students distinguish main points from less important ones	Repeating main points to myself. Get the important stuff memorised first
Paraphrasing	Helping students restate lecture notes in their words or in their ways.	Writing the additional notes…was most useful because I was able to put the words in my own way.
Linking	Helping students to "link" or "relate" ideas in lecture notes to each other	It allows me to put the information into a way I feel makes me remember by linking words or ideas...
Organisation	Helping in organising lecture notes or giving a structure to them	I go over my notes and try to give them more structure to put information into groups.
Summarising	Helps students to summarise the lecture notes	This is useful because images... can often summarize a lot of information...
Explaining	Helping students to "explain" the meaning of the lecture notes	Talking with other people... allows me to explain my interpretation of the information.
Placing in context	Helping students to place information into the context	My mental images place me back in the context of when I learnt the material...

APPENDIX 4:
REASONS WHY REVIEW STRATEGIES
WERE NOT REGARDED AS USEFUL

Social reasons	Lack of social context
	Time consuming
	Effort consuming
Efficiency reasons	More information to learn
	Not relevant
	Redundancy
Difficulty reasons	Confusing
Simple reasons	Forgetting the letters
	Misplace
	Only repetition
Less complex reasons	No understanding
More complex reasons	No link
	Removes context