



## **Flexible resources for flexible courses – are these really helping students perform in an assessment-driven learning environment?**

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At this regional university, second year Human Biochemistry is taught concurrently in both the face-to-face and distance education modes. Consequently, a variety of different resources are made available through an online subject portal, to assist all students in their learning. However, despite the availability of different resources, assessment in biochemistry is still predominantly examination-based, and subsequently student learning remains focused on “what will be in the exam?”. This pilot study examined how students studying biochemistry differently perceived an array of flexible learning resources provided to them, and examined whether there was a relationship between overall subject performance and the usefulness of different flexible resources.

Following the completion of Human Biochemistry, face-to-face students were contacted and surveyed on their perceived usefulness of the different resources made available to them. Students who completed the questionnaire also gave permission for their final grade to be compared to the questionnaire responses.

This paper discusses the types of resources made available to students and their perceived usefulness. Furthermore, this paper attempts to evaluate the possible effectiveness of flexible resources in assisting students in their preparation for examination-based assessment tasks.

### **Introduction**

As educational institutions become increasingly market driven, and in an attempt to enhance the international competitiveness of their institution, universities are increasingly offering courses through flexible delivery modes (O’Donoghue, Singh and Dorward 2001). A flexible offering of courses allows increased access to courses by those who may otherwise not be able to attain a university qualification. Offering courses and individual subjects through a flexible study mode, such as distance education, requires the development or modification of resources and materials such that students can complete a subject without having face-to-face contact with a lecturer (Chalmers 1999). Traditionally, distance education mode university students would be provided with subject notes, sample chapters and other written resources (Harper, Chen and Yen 2004). Printed study guides were prepared to help students navigate their way through the readings, textbook and subject material. Cassette recordings of lectures may have also been provided to students. Advances with the Internet and development of online technologies has now expanded the resources available to students, and enabled courses to be more flexible in the way they are delivered. For example, students may have access to digital learning objects, including the use of a synchronous or asynchronous communication space (referred to herein as an online forum). Subject material may be accessed online, and frequently textbooks have additional support material online.

At this regional university, courses and individual subjects are frequently taught in flexible modes of delivery. For example, Human Biochemistry is taught in semester 1 to students in both the face-to-face and distance education modes. All students in the subject share a common online subject “page”, which includes a subject outline and hyperlinks to an online subject forum and space where new resources can be uploaded during session. Consequently, the range of multi-media resources available to students studying this subject in the face-to-face mode includes the resources available to

students studying this subject in the distance education mode. In addition to the “standard” resources such as lecture attendance and access to a prescribed textbook, face-to-face students have access to the following online resources:

- Lecture notes available through the online subject page
- Online formative multiple choice tests, through the online subject page (termed MCQs)
- Tutorial questions/worksheets available through the online subject page
- Online subject forum, for discussions between students and teaching staff
- A study guide, written by the lecturers of the subject to help guide students through the material covered within the textbook. This is provided to all distance education students in print, and is available in electronic form online for face-to-face students.

Currently, learning outcomes in Human Biochemistry are assessed in examinations. A combination of eight “mini-tests” held during the semester (20%), and a final exam (65%) contributes towards the final grade. This pilot study sought to determine how useful students in a single class perceived the array of resources available to them, in their preparation for assessment tasks in Human Biochemistry. The results of this study would be used in the further development and modification of resources available to students studying Human Biochemistry.

## Methods

Within this study, the population of interest are undergraduate students studying subjects offered in flexible modes. The participants used in this study are second year students studying Medical Science, Nutrition and Dietetics, Biotechnology and Pharmacy at a regional Australian university. Students in these courses study Human Biochemistry during semester 1. During semester 2, second year students who had studied Human Biochemistry during the previous semester in the face-to-face mode were recruited for this study. Students were approached during compulsory on-campus practical classes and informed of the study.

Participation in this study was optional, and involved the completion of a short questionnaire. The questionnaire sought to gather information about students’ perceived usefulness of a range of resources available to students studying Human Biochemistry, in addition to obtaining participant data including sex, age, and course being studied. Students who completed the questionnaire gave permission to the researcher to access the final grades obtained in Human Biochemistry. After final grades were matched with questionnaires, questionnaires were de-identified so individual student responses were anonymous. This project was performed with the approval of the University Ethics in Human Research committee.

## Results

### Student profile

The response rate for this survey was 68.7% (n=68). Of the respondents, 66.2% (n=45) were female, and 33.8% (n=23) were male. These proportions are similar to the gender balance of the total cohort (64.6% females (n=64) and 35.4% males (n=35)). Table 1 illustrated the proportion of surveys returned from students studying each of the courses in which Human Biochemistry is taught, compared to the total number of students enrolled in each course.



### Perceived usefulness of resources

It was apparent, when analysing the data, that different students found a variety of different resources useful when studying for Human Biochemistry. As illustrated in Table 2, for all resources listed in the questionnaire, the majority of students agreed, strongly agreed or very strongly agreed they played a useful role in their studies. Attending lectures and the availability of lecture notes online were perceived as the most useful subject resources, followed by the prescribed textbook, online MCQs and worksheets. Results relating to the usefulness of the study guide were not examined further, due to a low response rate for this item.

**Table 1.** The course distribution of both student respondents and the total student population contacted to participate in this study. Courses include B. Pharmacy (Pharm), B. Medical Science (including specialisations, Med Sci), B. Biotechnology (Biotech), B. Health Studies (Nutrition & Dietetics), and the Med Sci/Biotech double degree.

Course Distribution:	Pharm	Med Sci	Nutrition and Dietetics	Med Sci/ Biotech	Biotech	Other	Total
Survey Respondents	38 (55.9%)	13 (19.1%)	9 (13.2%)	7 (10.3%)	1 (1.5%)	0 (0%)	68 (100%)
All enrolled face-to-face students	42 (42.4%)	27 (27.3%)	13 (13.1%)	9 (9.1%)	6 (6.1%)	2 (2%)	99 (100%)

**Table 2.** The perceived usefulness of biochemistry resources. A Likert scale was used to find out how strongly student agreed that different resources were useful when studying Human Biochemistry. Results presented are the percentage (%) of questionnaire respondents (n=68), rounded to whole numbers. S/VS = strongly or very strongly.

Resource:	Textbook	Lecture notes	MCQs	Worksheets	Online forum	Study guide	Attending lectures
S/VS agree	49	74	57	65	21	22	75
Agree	37	17	28	22	44	9	18
Uncertain	9	0	7	9	18	12	3
Disagree	6	2	3	2	7	0	3
S/VS disagree	0	2	0	0	2	2	0
No answer	0	6	4	3	9	56	2
Total	100	100	100	100	100	100	100

Questionnaire results were then compared with the Human Biochemistry final grades obtained by student respondents. Table 3 highlights the percentage of students who obtained each type of grade who perceived particular resources to be useful, compared to those that did not. The results are striking. Between 60% and 100% of students obtaining any grade in this subject perceived all resources to be useful. These findings suggest that whether a student finds a resource useful is not an indicator of final performance.

Finally, regression analysis was performed to investigate whether there was a statistical correlation between the perceived usefulness of any particular resource with the overall grade achieved. Whilst the small sample size may have impacted on the level of statistical analysis possible in this study, some significant though statistically weak correlations were observed. Students with higher grades reported that attending lectures was more useful than students obtaining lower grades ( $r=0.247$ ,  $p<0.05$ ). A positive correlation was found between the usefulness of attending tutorials and using worksheets ( $r=0.56$ ,  $p<0.01$ ) and between the usefulness of attending both tutorials and lectures ( $r=0.635$ ,  $p<0.01$ ). Interestingly, females reported a higher perceived usefulness of online lecture notes ( $r=0.315$ ,  $p<0.05$ ), worksheets ( $r=0.324$ ,  $p<0.01$ ), and attending tutorials ( $r=0.325$ ,  $p<0.05$ ), compared to males. However, it is possible that males and females differ in their interpretation of the term “useful”, so these findings are to be interpreted with caution.

**Table 3.** Does the perceived usefulness of a resource impact on a student’s final grade? The percentage of student respondents who obtained a particular grade and indicated a particular resource was useful to some degree (very strongly agreed, strongly agreed or agreed) was calculated. The numbers in brackets are the number of respondents who agreed a resource was useful to some extent compare to the total number of students obtaining this grade and answered this question. HD = High Distinction, DI = Distinction, CR = Credit, PS = Pass, FL = Fail

	Textbook	Lecture notes	MCQs	Worksheets	Online forum	Attending Lectures
<b>HD</b>	75% (n=3/4)	75% (n=3/4)	100% (n=4/4)	100% (n=4/4)	50% (n=2/4)	100% (n=4/4)
<b>DI</b>	81% (n=13/16)	100% (n=15/15)	94% (n=15/16)	100% (n=16/16)	73% (n=11/15)	100% (16/16)
<b>CR</b>	80% (n=12/15)	100% (n=14/14)	80% (n=12/15)	86% (n=12/14)	100% (n=12/12)	93% (n=14/15)
<b>PS</b>	89% (n=24/27)	96% (n=25/26)	88% (n=21/24)	85% (n=22/26)	60% (n=15/25)	88% (n=23/26)
<b>FL</b>	100% (n=6/6)	100% (n=5/5)	100% (n=6/6)	83% (n=5/6)	67% (n=4/6)	100% (n=6/6)
<b>Total</b>	n=58/68	n=62/64	n=58/65	n=59/66	n=44/62	n=63/67

## Discussion

In analysing the results of this pilot study, a number of methodological flaws have been identified, which could be improved upon in subsequent studies. Firstly, the survey instrument used did not reveal sufficient information regarding how students used different resources to help them in their learning. Perhaps students could have been questioned on how frequently different resources were used, at what time during session they were used, or how long each resource was used for each week during session. A student who failed overall may have found different resources useful in the final few weeks before examinations, but insufficient learning during the session may have contributed to insufficient time to properly utilise these resources. Finally, perhaps individual course groups could be surveyed in more detail, to determine if students studying different courses are more inclined to use different resources. In conclusion, this pilot study has revealed that the wide range of resources available in a subject offered in face-to-face and distance education modes are all considered as useful by the majority of students. However, whether a resource is used, or perceived as useful, by a student, is generally not a predictor of overall performance in examination-based assessment.

## References

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