

Technology-enabled delivery and assessment methods: Are we addressing student expectations and learning preferences?

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Abstract

The role and importance of technology in an educational environment is growing and changing at a rapid pace. This technology has the potential to address many deficiencies of more traditional educational models, but also has accompanying potential drawbacks. As educators, we are balancing on a daily basis, differing expectations of our students (particularly across the generations), changing societal norms in relation to the balancing of work/life and education, and the turbulent landscape of resource allocation and focus in the tertiary education sector. This study provides insights into student perceptions and expectations in three large, cross-discipline courses, each using different forms of technology-enabled delivery or assessment. In particular, the study considers individual students' learning styles and whether this impacts their preference for, or expectations and experiences of technology-enabled learning.

Keywords

learning styles, tertiary education, flexible delivery, web delivery, technology, online assessment

Note: To maintain consistency, throughout this paper, the term "course" is used to refer to an individual unit of study undertaken as part of an undergraduate program. Some institutions may refer to these as "subjects" or "units".

Introduction

The introduction of technology to the learning environment has presented many opportunities and challenges for both students and educators alike. The aim of this paper is to explore the perceptions and expectations of students, particularly in relation to preferences of the learners that can be supported by the effective use of technology.

Many universities are turning to web-based and technology-enhanced approaches to course delivery to improve student learning. It has been argued that online learning potentially provides meaningful learning activities (Anderson, 1996). In many universities in Europe and North America, the use of face-to-face lectures combined with tutorials or workshops is regarded as the preferred, if not the only, delivery medium for materials. That has not been, and is not, the case in Australia.

Some Australian universities have been designated as centres for distance education, and in particular, Central Queensland University (CQU) has established a strong reputation as a provider of distance education. Using web-based technologies is of great interest to these institutions — including CQU — as it has the potential to improve the delivery and enhance students' learning in distance education and is also increasingly being used to supplement face-to-face delivery.

This paper begins by reviewing the ever-growing literature in the field of technology-enhanced learning, and provides a number of varying views on the extent to which it should be used to capitalise on advantages and accommodate learning styles. The study is then described and the key findings and implications for educators are highlighted.

Literature review

Factors impacting technology-enabled delivery

The amount of research addressing web-based delivery as a supplement to or replacement for face-to-face delivery is growing. A number of researchers have reported that whilst the delivery of online courses enhances student learning in some respects, they also caution against using the technology without adequate regard for the learning outcomes being sought (Buckley, 2003; Lawther & Walker, 2001; Willett, 2002). Mariani (2001) noted that new technologies including discussion boards (or lists), should only supplement traditional teaching. There are also warnings that the teaching should drive the technology and not vice versa (Petrides, 2002).

Smith and Ferguson (2002) argue that much can be gained from online delivery; the encouragement of deeper levels of discussion, the ability to consider responses due to the asynchronous nature of the medium, and the minimisation (if not elimination) of the power differential between student and teacher.

However, Smith and Ferguson (2002) also warn that with these benefits come a number of disadvantages including the potential technology failures, the lack of face-to-face and therefore interpersonal cues, and from the instructor's viewpoint, a great deal of time and effort in converting traditional text-based content to information suitable for online delivery.

Overall, it is suggested that even though delivery online offers new challenges, it is viewed as worthwhile by those on both sides; the learners and the facilitators (Smith & Ferguson, 2002). However, it has also been suggested that with this explosion of new technology in higher education, we need to be cognisant that it leads to a change in the way students learn and potentially changes the role of educators to more of an advisory rather than instructing role (Teichler, 2001). As academics we need to be aware of these changes.

According to Slay (1997) problems have emerged in the development of web-based delivery packages and tools because academics have little experience in designing and using this medium of material delivery. These developmental problems can be exacerbated further because as George (1996) argues, the form of delivery can produce particular types of learning behaviours so that web-based delivery is not a neutral medium. As it is not neutral, we, as academics, need to study the impact of the medium and the material on students and this research is intended to examine students' perceptions of web-based learning materials in a number of different contexts and disciplines. O'Malley (1999) argues that often new educational technologies, such as web-based learning, are implemented without any assessment of impact on students and in his model of student perception suggests that prior educational conditions, perceived characteristics of online learning and characteristics of the student influence the perceived effectiveness of online learning.

A model of contemporary education effectiveness

These factors have been developed into a model of contemporary education effectiveness, shown as Figure 1 on the following page. This model developed as an integral part of this research project identifies attributes of the learner as an individual, attributes of a learner, and attributes of the course and its delivery as all impacting upon student learning and subsequent outcomes. The broader research project conducted sought to measure a range of student attributes in courses with different approaches to determine impact on expectations and perceptions.

This paper focuses specifically on the students' learning styles and the impact on experiences in the three courses utilising technology-enhanced delivery and/or assessment.

As tertiary educators, in order to meet the ever-changing needs of our students, we are in a continual process of evaluation and review. We need to be aware of this, as Laurillard (1993) notes not only our subject, but the ways in which it is understood and misunderstood and experienced by our students. McNaught (2002, p. 14) stated that "people design educational environments based on their experiences (and perceptions) of teaching and learning" and she also believed that our goals are generally constructivist. As educators using technologies, it is important to consider the relationships between the technology and teaching strategies so that we can better design courses. The challenge is to meet the learning needs of individuals and the groups with which they identify within a student cohort.

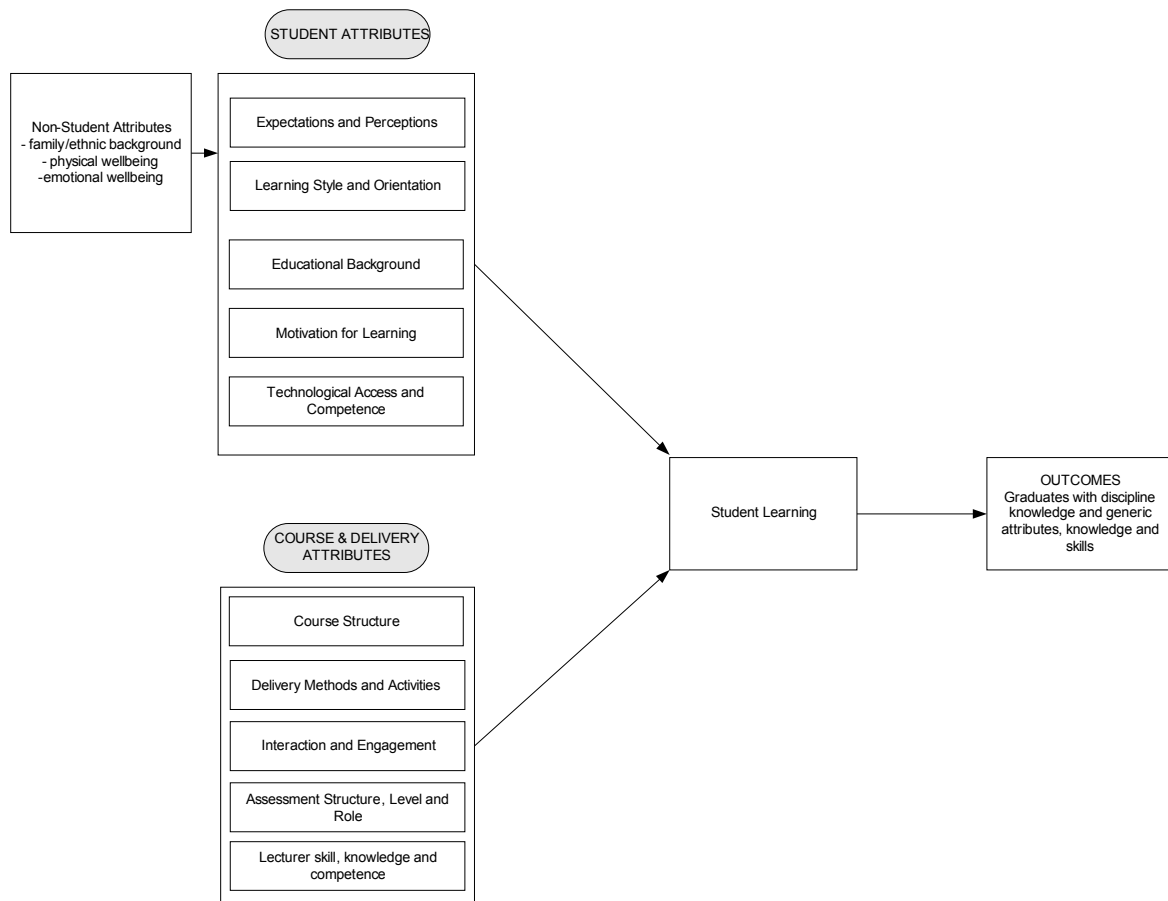


Figure 1: Contemporary education effectiveness model (Becker, Kehoe, & Tennent, 2005)

Generational issues

With regard, in particular, to the composition of the student cohort there is growing recognition that the split between the three generations; Baby Boomers, Generation X and Generation Y, now widely recognised to be present within the workforce (Gardyn, 2000; Hill, 2002), may also prove a challenge for learning institutions. The Baby Boomer generation is widely accepted to span the birth years from 1945–1960; Generation X from 1960–1980, and Generation Y from 1980 to present (Robbins, Millett, & Waters-Marsh, 2004).

Research into the differences between the Baby Boomer generation and Generation X, has shown significant differences. The Baby Boomers are considered to be conservative, hardworking and willing to persevere with undertakings (Robbins et al., 2004). In contrast, Generation X prefer to work alone, are more comfortable with technology, and possess higher levels of education (Booth (1999) as cited in Rodriguez, Green, & Ree, 2003). Generation X are described as “independent problem solvers and self-starters, technologically literate, responsive, focused, lifelong learners, ambitious and fearless” (Bova & Kroth, 2001, p. 58). These traits have significant ramifications for educators, and highlight that even though we can generally assume a level of comfort with technology, as previously highlighted we also need to be prepared for different approaches and behaviours in the learning environment (Teichler, 2001).

With the more recent addition of Generation Y (also known as the Nexters or Internet Generation), and a further shift in expectations, those in academic positions (comprising significantly of the Baby Boomer generation) are coming under increasing criticism for failing to recognise these important changes (Hill, 2002). In fact, it has been said, “curricula often seem uninspired, with course titles steeped in academic jargon and functional rigidity that fail to mirror the cross-disciplinary way organisations are truly managed” (Hill, 2002, p. 60). In the adoption of some more flexible methods of delivery and assessment, the courses described in this research are attempting to address these perceived inadequacies. In this particular sample, with over 75% in the Generation Y category, it is imperative that consideration is given to the unique needs of such a cohort.

Within the context of these significant changes in the learning environment, both with the increasing use of technology, and the changing learning behaviour and approaches of students, the key issue being addressed in this paper is the impact of learning styles on the way in which students perceive technology-enhanced and alternative delivery and assessment methods. A range of researchers utilise the concept of learning style in both the educational and organisational learning and development literature. It is common to see this concept operationalised and understood in a variety of different ways. In fact, Sadler-Smith (1996) points out that there is a lack of a generally accepted model for or understanding of learning styles in the literature.

It has been widely recognised that regardless of the measure used, making learners aware of their learning styles and how to accommodate this in the learning environment reaps significant benefits to learning outcomes (Fleming, 1995; Sadler-Smith, 1996; Schellens & Valcke, 2000; Vincent & Ross, 2001). Likewise, it is considered important that educators understand not only the concept of learning style but also have insight into their own learning style and the potential impact on the way in which they design and implement learning strategies, with the subsequent impact in particular on students with different learning styles to their own. Vincent and Ross (2001) are just one of many suggesting that strategies must be developed for use in the learning environment to accommodate the different learning styles or preferences, however they also suggest that using online resources can assist in this process.

Research aims and objectives

The objectives of the broader research conducted were to obtain:

- A measure of the perceptions of different groups of learners in relation to flexible delivery (that is, gender, age/maturity, learning backgrounds, cultural backgrounds).
- An understanding of what a sample of students see as effective flexible delivery methods.
- A measure of the extent to which learners view courses as either linked with generic skills or compartmentalised (view of teaching as skills building not just transfer of knowledge).
- An analysis of cross-referenced students studying different disciplines, with differing foci, to determine the extent to which this and other background factors influences student perceptions.

This paper reports only the findings in relation to students' experiences of flexible delivery and assessment in relation to their reported learning style. However, further analysis is currently being conducted in line with these broader research objectives.

Methodology

This study utilised a self-administered questionnaire that was distributed during classes in each of the courses. It was also provided to external students via mail and was made available online for completion by external students electronically. Completion of the questionnaire was entirely voluntary. The survey was comprised of a number of different sections relating to student's personal information and demographics, responses to a range of general questions relating to preferences, a group of statements relating specifically to the development of generic skills in tertiary education, and feedback on the particular alternate delivery and assessment methods used in each of the three courses.

In addition, the previously validated VARK questionnaire (Fleming & Mills, 1992) was used to assess learning preferences. The VARK model by Fleming (1995) determines an individual's preferences for learning and breaks them into the categories shown in Table 1.

Table 1: Description of VARK learning preferences

Preference	Description
Visual (V)	Those who prefer to take in information from pictures, diagrams, symbols, etc. and are interested in colour and layout to remember things.
Aural (A)	Those who prefer to have things explained to them rather than reading something or looking at pictures or diagrams.
Read/write ®	Those who prefer to rely on things they read, and can write down. Their emphasis is likely to be on reading to take in information, and they have a preference for words and lists.
Kinesthetic (K)	Those who prefer a "hands on" approach to learning. They value practical, relevant information and need to "do" to understand.
Multimodal (MM)	Those who, rather than indicating a preference for one of the above profiles, has strong preferences in 2 or more.

It is acknowledged that a range of instruments could have been utilised, including such widely-recognised models as the Learning Styles Inventory (Kolb, 1984) or the Learning Styles Questionnaire (Honey & Mumford, 1992). It was considered however, that this previously validated instrument, designed and delivered specifically within the tertiary education sector was brief enough to be included within a larger survey, but comprehensive enough to give sufficient information regarding the learning preferences of individual students.

For this particular analysis, a group of statements from the survey in relation to students' reactions to and expectations and perceptions of alternative delivery and assessment methods were chosen for analysis against learning styles. The statements chosen related to perceptions and expectations of course delivery and assessment that would be able to be implemented via the use of technology, and in fact had been addressed in the three courses studied. Whilst the inclusion of some of the more specific questions relating to the specific delivery and assessment methods used in each course may also provide further indication of the impact of learning styles, for the purposes of comparison across groups, these selected general statements were used.

Sample

The courses researched are all introductory-level, core, undergraduate courses in the Faculty of Business and Law at CQU. This study intentionally chose courses from the three different disciplines of management, law and accounting, utilising three different forms of alternative delivery and/or assessment in order to analyse the students' engagement and reactions. It was believed that these courses provide a unique opportunity to review the online education experience by considering the three differing but complementary forms of online engagement and assessment.

The research provided the opportunity for coverage of a broad range of students, across a number of disciplines, utilising different approaches considered to be flexible delivery and assessment. Specifically, the human resource course utilises online assessment via multiple choice quizzes and discussion lists; the law course utilises a flexible form of material delivery via online lecturers, and the accounting course utilises online tests and discussion lists for assessment purposes.

However, the courses differ not only in terms of the methods being utilised, but also in the content and nature of the courses themselves allowing the research to identify whether this variable is significant in terms of flexible learning and teaching. The human resource course covers mostly information at a conceptual level, the law course focuses more on understanding and the recognition, application and analysis of the law, and the accounting course is focused more upon issues involving analytical and numeracy skills.

The population frame consisted of all students enrolled in at least one of these three undergraduate level courses. A total of 891 students responded to the survey, across a range of locations, representing a response rate of approximately 45%. The learning styles of the students were assessed and the breakdown is shown in Figure 2. It is important to note that due to the small size within the sample of students reporting multimodal approaches, this group is not included in any further analysis due to the increased likelihood of it skewing the findings.

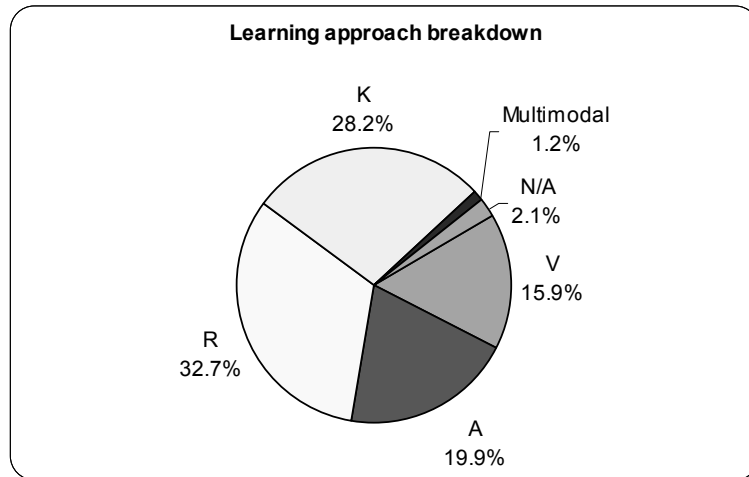


Figure 2: Spread of student learning styles

Findings and discussion

Five statements were chosen from the survey to be crosstabulated with learning styles. The statements address issues such as preferences for choice of delivery method and choice of assessment, preferences for group as well as individual assessment, and outlook on self-paced learning. Whilst at first examination, these statements may not all appear to relate specifically to technology-enabled teaching practices, they have significant implications for alternate delivery methods, as all of these can be enabled by technology and have all been used to some extent in the courses included in this study.

Table 2 shows the crosstabulation of the level of agreement with the statement: “*I don’t prefer a course that has all online/ web-based materials*” by the different learning styles. It can be seen that there are no huge variations in the level of agreement among the different learning styles, $\chi^2 = (12, N=849) = 18.23, p < .10, ns$. Interestingly, most of the sample ranked between ‘agree’, ‘neutral’ and ‘disagree’ accounting in average for more than 60% of the students despite their learning styles. In addition, it should be noted that the proportion of students that declared neither agree nor disagree is slightly higher than other statements, suggesting a certain ambivalence to this delivery method. This situation indicates that the learning styles do not influence directly the preference for an online course among the surveyed students. This assumption is confirmed with the results of the one-way ANOVA $F(3, 845) = 1.43, p = .23, ns$, that corroborates that significant differences do not exist in the level of agreement about this statement among the different levels of agreement.

Table 2: Crosstab of preference for online materials

		Learning styles				Total	
		Kinesthetic	Aural	Read/write	Visual		
Q15	STRONGLY AGREE	Count	24	13	24	9	70
		% within learning styles	9.6%	7.4%	8.4%	6.4%	8.2%
	AGREE	Count	56	46	56	40	198
		% within learning styles	22.5%	26.3%	19.6%	28.6%	23.3%
	NEUTRAL	Count	83	61	85	40	269
	% within learning styles	33.3%	34.9%	29.8%	28.6%	31.7%	
	DISAGREE	Count	51	45	85	36	217
	% within learning styles	20.5%	25.7%	29.8%	25.7%	25.6%	
	STRONGLY DISAGREE	Count	35	10	35	15	95
	% within learning styles	14.1%	5.7%	12.3%	10.7%	11.2%	
Total		Count	249	175	285	140	849
		% within learning styles	100.0%	100.0%	100.0%	100.0%	100.0%

Providing additional reinforcement of this finding, another question sought to address this same issue in a different way using the statement: “*I would prefer the traditional lectures/study material to alternative delivery and assessment methods*”. There were likewise no significant differences between learning styles in relation to this statement.

Table 3 shows the crosstabulation of the level of agreement with the statement: “*I prefer to have a choice between web-based or printed materials*” by the different learning styles. It can be observed that there were no important variations in the level of agreement about the above $\chi^2 = (12, N=856) = 19.01, p < .09, ns$. Nevertheless, it ought to be noticed that students with ‘aural’ learning style ‘strongly agreed’ considerably less than the others, and this could indicate that these students prefer to have this choice slightly less than students from the other learning styles. The result of the one-way ANOVA was also found not to be significant $F(3, 857) = 1.26, p = .29, ns$, indicating that the means of the agreement level among the different learning styles do not vary significantly.

Table 3: Crosstab of preference for choice of delivery method

		Learning styles				Total	
		Kinesthetic	Aural	Read/write	Visual		
Q17	STRONGLY AGREE	Count % within learning styles	64 25.6%	21 11.9%	59 20.6%	26 18.3%	170 19.9%
	AGREE	Count % within learning styles	117 46.8%	106 59.9%	158 55.1%	76 53.5%	457 53.4%
	NEUTRAL	Count % within learning styles	56 22.4%	43 24.3%	62 21.6%	35 24.6%	196 22.9%
	DISAGREE	Count % within learning styles	11 4.4%	7 4.0%	6 2.1%	5 3.5%	29 3.4%
	STRONGLY DISAGREE	Count % within learning styles	2 .8%	0 .0%	2 .7%	0 .0%	4 .5%
Total		Count	250	177	287	142	856
		% within learning styles	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4 shows the crosstabulation of the level of agreement with the statement: “*I think it is important to have group assignments as well as individual assessment*” by the different learning styles. As educators, the responses were quite surprising to us. Anecdotally and traditionally, undergraduate students (for a range of different reasons) have disliked group assessment. It can be seen, however, that a vast majority of respondents despite their learning style either ‘agreed’ or ‘strongly agreed’ with the above statement. In considering this finding, we need to be mindful however of the previously highlighted age demographic of this sample. As the sample is compiled of 75% of students within Generation Y, this may also be an indication of a changing shift in orientation and attitude towards such learning strategies.

It can be observed that people with ‘kinesthetic’ learning style slightly ‘strongly agreed’ more than the others, suggesting that for these students the group assignments are considered a bit more important than for the students with other learning styles. The kinesthetic learner has a preference for “hands-on” learning involving experience and the ability to practice and become involved (Fleming & Mills, 1992). It has also been noted that this preference is in fact multi-modal in that a range of senses may be used in the process of experience and practice. Therefore this finding is consistent with a hands-on approach, given that group work encourages the use of interaction amongst students and the ability to discuss topics in a variety of ways.

However, the results of the chi-square test were not found to be significant $\chi^2 = (15, N=854) = 16.90, p = .33, ns$. This verifies that there were no significant variations in the distribution as a function of the learning styles. Consistent results were found in the one-way ANOVA, $F(3, 850) = .88, p = .52, ns$, which indicates that there were not significant differences in the means of the level of agreement with this item among the different learning styles.

Table 4: Crosstab of preference for use of group and individual assessment

			Learning styles				
			Kinesthetic	Aural	Read/write	Visual	Total
Q21	STRONGLY AGREE	Count	59	33	51	26	169
		% within learning styles	23.9%	18.6%	17.6%	18.6%	19.4%
	AGREE	Count	102	76	125	55	370
		% within learning styles	41.3%	42.9%	43.1%	39.3%	42.4%
	NEUTRAL	Count	48	42	61	35	188
	% within learning styles	19.4%	23.7%	21.0%	25.0%	21.5%	
	DISAGREE	Count	22	24	39	16	104
		% within learning styles	8.9%	13.6%	13.4%	11.4%	11.9%
	STRONGLY DISAGREE	Count	16	2	13	8	41
		% within learning styles	6.5%	1.1%	4.5%	5.7%	4.7%
Total		Count	247	177	290	140	873
		% within learning styles	100.0%	100.0%	100.0%	100.0%	100.0%

Table 5 shows the crosstabulation of the level of agreement with the statement: “*I appreciate the opportunity to complete a course at my own pace and at a time that suits me*” by the different learning styles. The results of the Chi-square test were found to be significant, $\chi^2 = (12, N=860) = 26.07, p=.01$, indicating that the variations in the level of agreement among the learning styles were significant. In fact, it can be noted that students with ‘aural’ learning style were considerably less likely to ‘strongly agree’ with the above statement and also they were more likely to be ‘neutral’ compared to the other learning styles, this situation suggests that students with ‘aural’ learning style generally value less the opportunity to complete a course at their own place and at a time that suits them. Considering that those with an aural learning preference learn best from listening and discussing information (Fleming, 1995), these students are more likely to be the ones gaining most from lectures and tutorials, and hence the traditional approach to delivery is accepted by them.

The One-way ANOVA that was conducted was found to be significant, $F(3, 856) = 2.85, p=.04$, indicating that at least one significant difference between the means about agreement level exist among the different learning styles. Looking at the means there is a considerable difference between the level of agreement between students with ‘visual’ ($\bar{X}=1.89$) and ‘aural’ ($\bar{X}=2.09$), suggesting that students in the first learning style tend to appreciate flexibility in university courses than do ‘aural’ students.

Table 5: Crosstab of preference for self-paced learning

			Learning styles				
			Kinesthetic	Aural	Read/write	Visual	Total
Q22	STRONGLY AGREE	Count	75	34	76	41	226
		% within learning styles	29.9%	19.2%	26.2%	28.9%	26.3%
	AGREE	Count	136	98	152	81	467
		% within learning styles	54.2%	55.4%	52.4%	57.0%	54.3%
	NEUTRAL	Count	32	41	44	16	133
	% within learning styles	12.7%	23.2%	15.2%	11.3%	15.5%	
	DISAGREE	Count	6	3	17	2	28
		% within learning styles	2.4%	1.7%	5.9%	1.4%	3.3%
	STRONGLY DISAGREE	Count	2	1	1	2	6
		% within learning styles	.8%	.6%	.3%	1.4%	.7%
Total		Count	251	177	290	142	860
		% within learning styles	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6 shows the crosstabulation of the level of agreement with the statement: “*I would like the opportunity to choose the assessment which best suits me*” by the different learning styles. The results of the one-sample Chi-square that was conducted were found to be significant, $\chi^2 = (12, N=858) = 28.52, p<.01$. This indicates that there are significant variations in the level of agreement with the above statement as a function of differences in learning styles. Consistent results were found when the one-way ANOVA was conducted

F (3, 854)= 4.26, $p < .01$, indicating that there were significant differences in the means about the level of agreement with this statement among the different learning styles.

In fact, Scheffe post-hoc comparisons showed that 'kinesthetic' students ($\bar{X} = 1.73$) would like significantly more to have the opportunity to choose the assessment that best suits them than 'read/write' students ($\bar{X} = 1.93$). This finding is not surprising when considering more traditional forms of assessment predominantly cater to the 'read/write' preference using methods such as assignments and exams. In comparison, those with a preference for a more hands on learning such as kinesthetic, tend to be less considered in such traditional approaches. The fact that across all styles, this preference is also strong may also be reflective of the predominantly younger generation within this cohort, who are more likely to have been exposed to alternate assessment methods in prior learning environments such as their secondary education.

Table 6: Crosstab of preference for choice of assessment

		Learning styles					
		Kinesthetic	Aural	Read/write	Visual	Total	
Q23	STRONGLY AGREE	Count	109	50	86	53	298
		% within learning styles	43.4%	28.2%	29.8%	37.6%	34.7%
	AGREE	Count	107	101	138	54	400
		% within learning styles	42.6%	57.1%	47.8%	38.3%	46.6%
	NEUTRAL	Count	30	22	54	27	133
		% within learning styles	12.0%	12.4%	18.7%	19.1%	15.5%
	DISAGREE	Count	3	4	9	6	22
		% within learning styles	1.2%	2.3%	3.1%	4.3%	2.6%
	STRONGLY DISAGREE	Count	2	0	2	1	5
		% within learning styles	.8%	.0%	.7%	.7%	.6%
Total		Count	251	177	289	141	858
		% within learning styles	100.0%	100.0%	100.0%	100.0%	100.0%

Conclusions

A number of conclusions can be drawn from the data analysis. It is pleasing to note that learning styles do not appear to influence overall preference for online courses, given the recent move to online learning for both on-campus and distance students. However, there remain a significant percentage of students reporting that they do not want all course delivery to be done online. This provides reinforcement to the claim by Mariani (2001) that new technologies should only supplement more traditional forms of teaching.

There has also been an overall shift to a preference for the inclusion of group assessment within courses. This is surprising given the general opposition to group assessment traditionally encountered in tertiary students. The kinesthetic learning style in particular reflected a slightly higher preference for this form of assessment than other learning styles. Group processes have been conducted successfully online previously (Windeknecht, 2003; 2004) and it is suggested that these methods could be further explored given the increasing openness to group assessment.

Specifically, those with an aural learning preference are less likely to desire flexible delivery methods, indicating that as could be expected, the more traditional forms of delivery are acceptable for their needs. Finally, those with a kinesthetic preference are more likely than those with a read/write preference to favour being offered a choice of assessment. Again, this would indicate that traditional forms of assessment such as assignments and exams have catered sufficiently to some needs more than others.

These findings on the whole, suggest that there are changing expectations of our students in relation to delivery and assessment in tertiary education. Whilst it appears that learning styles do impact upon these expectations and preferences, it is also noted that the particular cohort within this study were showing early indications of a general shift in preferences for their learning environment. This might also be influenced by the significantly younger respondents and the fact that Generation Y was strongly represented in the sample.

The challenge for all educators from these results is to try to accommodate learning styles whilst catering to changing expectations in a broader sense. Technology provides a vehicle by which we can address changing needs, but it is clear that students still wish to engage in a meaningful way with those facilitating their learning. It is up to us to find innovative ways to rise to this challenge.

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