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The Relationship between Preferred Modal Learning Style and Patterns of Use and Completion of an Online Project Management Training Programme

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Abstract

This paper reports the results of a pilot study, conducted to observe and evaluate the patterns of use and completion of a set of project management units and to identify any relationships between these factors and learning style. The aim of the study was to gather data on which to base a subsequent software development project, based around personalising the learning materials. The participants were adult professionals employed in public sector organisations in the UK and the study was based within a real business e-learning environment. Data regarding preferred learning style was collected via a questionnaire and usage, progress and completion rates were gathered from computer logging data, with user permission. To assess preferred learning style, the VARK inventory (Fleming and Mills, 1992) was used; this categorises learners according to modal preference for learning: Visual, Auditory, Read/write and Kinaesthetic. The results showed that learners with a preferred Visual mode showed the best record for completions and were characterised by frequent usage, but for relatively shorter study durations. In contrast, learners preferring the Auditory modality had the lowest proportion of completions, and also this group logged on less frequently but for longer study periods. Learners with a preferred Kinaesthetic mode were characterised by the highest proportion of 'In-Process' learners (who were regularly using the system but not yet completed). The paper concludes with a proposal to build a personalisable learning environment incorporating specific modal features. A further study will then observe more closely the interaction between preferred modal learning style, mode of presentation and usage and performance.

Keywords: VARK, modal learning style, business e-learning, project management

1. Introduction

This paper reports the findings of a longitudinal study which took place over the course of 14 months. The study was set up to naturally observe learners' patterns of use and completion of a set of units within a real business e-learning environment, rather than as a controlled study. The study aimed to identify relationships between learning style and the way the learning materials were used, in terms of study duration and times of the day as well as completion rates. The reason for conducting the study was to gather data on which to base a subsequent software development project, based around personalising the learning materials. A new system would provide varying levels of visual, written and auditory

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learning resources and modal preference was identified as a factor which could be important in producing an adaptive and personalised learning experience.

Various Learning Style inventories were considered, for example the Cognitive Style Inventory (Allinson & Hayes, 1996) and the Inventory of Learning Styles (Vermunt, 1992) were examined. One family of models which was identified as being appropriate to the aims of the research were those that consider sensory modality preferences. The models in this family may use different terms to describe the same or similar learning styles, but often describe three basic learning styles: auditory (through hearing the spoken word), kinesthetic (through interacting) and visual (through images, demonstrations and body language). In such models, the term *multi-modal* describes people who have more than one strong modal learning preference.

After much consideration, the VARK inventory (Fleming and Mills, 1992) was used; this categorises users according to modal preference for learning: Visual, Auditory, Read/write and Kinaesthetic. Fleming and Mills (1992) acknowledge that there is some overlap between preferences and define the four preferences as follows:-

Visual (V)

This preference includes the depiction of information in charts, graphs, flow charts, and includes all of the symbolic arrows, hierarchies and other devices that instructors use to represent what could have been presented in words. It does not include movies, videos or PowerPoint.

Auditory (A)

This perceptual mode describes a preference for information that is heard or spoken. Students preferring this modality report that they learn best from lectures, tutorials, tapes, speaking, group discussion, as well as email and web chat.

Read/write (R)

This preference emphasises text-based input and output - reading and writing in all its forms.

Kinaesthetic (K)

This modality refers to the, ‘perceptual preference related to the use of experience and practice (simulated or real)’. Although such an experience may invoke other modalities, the key is that the student is connected to reality, ‘either through concrete personal experiences, examples, practice or simulation’ [Fleming & Mills, 1992, pp. 140-141].

Each single preference can be mild, strong or very strong preference for that mode. Although there are only four different preferences on the VARK scale, there are 23 different permutations of preferences and it is possible to be multi-modal, with any combination of the preferences (e.g. AR, VRK or even all four VARK). Students who are multi-modal often need to process information in more than one mode in order for learning to occur.

2. Method

2.1 Participants

The participants comprised of adult professionals from a set of public sector organisations based in the UK. The majority of learners were mature professional workers, aged from 30 to 45 years, with 2 - 5 years project management experience.

The participants were informed that the data collected would not be personally identifiable and that it would be used for research purposes only. The responses to the questionnaire were recorded into the database using the learner's unique user id (primary key) rather than their names. The unique user ids were used consistently across the system to link and identify associated attributes across the system. The uniqueness of the user base is in the fact that they all come from public sector organisations.

2.2 System and learning environment

The study was based upon use of an online version of the standard project management method (PRINCE2[1]). The learning materials consisted of 12 online modules with a total of 115 lessons. Each lesson introduces and builds upon previous concepts via a slide which consists of text with visual support. The learning environment fosters active learning by promoting exploration, experimentation, construction, collaboration and reflection. This is done using for example: Notes (contextual information), Reference (references to the PRINCE2 Manual), a Quiz (comprehension / retention) and Tasks (application of concepts).

Learning was initiated after a brief face-to-face (classroom) induction session with introductions to the subject matter, product, e-learning and support facilities. These sessions were led by an accredited trainer. Although the learning content is structured for linear progression, the system is flexible and allows learners to choose their preferred approach. Subtle progress bars remind users of the extent of progress and module tests advise learners of the level of understanding and the expected levels for certification. Most participating authorities make provisions for specific time for the learning during working hours; however the users are free to access the learning platform from anywhere, at anytime as long as they are connected to the internet.

2.3 Materials

[1] **PRINCE2** is a methodology in project management. It is a best practice in project management and a defacto standard in the public sector (UK). The methodology is being widely adopted by the private sector and abroad.

An online version of the VARK Learning Preferences Inventory was used. The VARK questionnaire is administered through a set of 16 multiple choice questions. The learning preference questionnaire was presented as part of the learning process on the second login to avoid any potential questionnaire fatigue (as baseline and motivation questionnaires had been administered prior to the start of learning). NB Further measures of motivation and qualitative follow-up data were also collected, however they are not considered in this paper (see Pereira, Jones & Taylor, submitted 2008).

3. Results

3.1 VARK data

The sample was made up of 31% of learners with a single modal preference and the remaining 69% of learners were multi-modal; this is close to the VARK norms of 38% / 62%. Due to the sample being opportunistic (rather than representative and random), there were not equal numbers of learners in each of the VARK modal preferences. The percentages were: Visual 22%, Auditory 19%, Read/Write 29% and Kinaesthetic 30%.

3.2 System usage data

Measures of system usage included frequency, duration and time and day of login. Also learners progress was divided into four distinct groupings, which were clearly observed from the data.

‘Non-Starters’

This group of users have 2 or less logins and have not logged-on during the past 5 months. The average time spent was 26 minutes, spread over an average of 5 days.

‘Drop-Outs’

This category of users has more than 2 logins but have not logged-on during the past 5 months. This group have an average of nearly 11 logins spread over 35 days with nearly 6 hours of study.

‘In-Process’

This is the largest of the groups and represents active users who are yet to complete their learning. Learners in this group have logged-on an average of 11 times, spread over 66 days with an average of 6 hours of study.

‘Completed’

This category forms approximately 20% of the total users. The average usage is 32 logins spread over 7 months and approximately 18 hours of study.

One of the key features of learners in the Drop-Out group is that the learning happens mainly during working hours and very little during the late evenings / early morning or

weekends. The majority (80%) of this time is spent during core office hours, the remaining 20% is spread across morning and evening twilight hours, with none during late evenings and weekends. In contrast, learners in the Completed group complete a fifth of their learning outside working hours (14% of their learning during weekends and about 7% during late evenings / early mornings). Learners in the Drop-Out group also have a lower frequency of usage but strangely a much higher average study period (of 44 minutes, compared with In-Process learners 29 minutes and Completed learners 42 minutes) and a longer time between logins.

3.3 Comparison of modal preference and system usage data

Table 1 shows the distribution of learners within each preferred modal style and their system usage status. As the learners are not equally distributed across each modal style category or each system usage grouping, the analysis looked at proportions to identify any similarities and differences in the data.

Table 1. The distribution of learners in each preferred modal style category and their system usage status.

Usage Status	*Modal Style*				
	V	A	R	K	Sub-totals
Non-Starters	0	2	2	1	5
Drop-Out	5	5	9	8	27
In-Process	30	28	41	46	145
Completed	17	10	19	18	64
Sub-totals	52	45	71	73	241

Individuals with a preferred Visual modality have a higher proportion of completions, higher scores and progress levels and a lower proportion had dropped out. Also, there are no learners with a Visual modal preference in the Non-Starter category. The average time spent is similar to the other modalities, however the usage frequency is higher indicating frequent but shorter study periods. The Auditory modality has the lowest proportion of completions despite relatively higher progress and scores. The usage frequency and time-spent data suggest less frequent logins and longer study periods (average 41 minutes) and the individuals with this modality preference also tend to do more of their learning during weekends (16%) and late evenings (8%) than any other modal preference. Learners with a Kinaesthetic modal preference are characterised by the highest numbers in the In-Process usage status and their usage pattern suggests frequent but shorter study periods.

Although there are only a small number of Non-Starters, it is interesting to observe that none of these have a Visual modal preference. When the proportions of In-Process learners are compared, it is interesting to note that the largest proportion was from learners with a Kinaesthetic modal preference. Of the Completed learners, the highest proportion came from those with a Visual modal preference and the lowest proportion came from those with an Auditory modal preference.

4. Discussion

The analysis of the modal preferences highlighted some interesting trends. The learners with Visual modal preference are characterised by frequent usage but with fairly short study durations and have the best record of completions (and lowest Drop-Outs). The learners with Auditory modal preference, in contrast have the worst record of completions (and the highest proportion of drop-outs and non-starters). They are characterised by less frequent logins but for relatively longer periods and also tend to do more of their learning during weekends and late evenings than any other modal preference. It may be then that Visual learners may perform better with a system which offers smaller modules or chunks of information, compared to Auditory learners, who may be able to sustain attention for longer. Read/Write modal preference learners have the highest proportion of Drop-Outs. Reasons for this are unknown, but it could be that learners with this modal preference would perform better using traditional paper-based materials, rather than the interactive multi-modal system used here. This would support previous research (Fleming, 2005).

The review on learning progress showed that there were no Non-starters amongst the learners with Visual modal preference. This could mean that the learning content is sufficiently visually engaging to ensure the learners return. Learners who had dropped out completed virtually all their learning during working hours, which is in contrast to Completed learners who complete 20% of their learning during late evenings and weekends. Drop-Outs also tend to have lower frequency of usage but with higher average study duration. Clearly, learners need to be encouraged to use the system out of office hours if they are to complete the course!

It is clear that there are some interesting interactions between modal preference, progress and usage times. However, further research is needed to identify whether progress is related to the modal preference or to the way that the system is used (e.g. out of office hours etc). Previous research has indicated that some learning environments are more conducive to some modal preferences than others. However, further study and observation is required to identify and isolate specific stimuli within this e-learning system that enable a learner with a particular modal preference to do better than others. For example, which specific elements of the instruction, presentation, content or channel are important for which type of learner.

The study was based on the natural use of an e-learning system by existing learners within a real business e-learning environment. This in contrast to much of the learning styles research which has taken place in traditional academic environments. However, this has not been without logistical problems, e.g. learners did not start at the same time and came from different organisations, with different training ethos etc. As a result, it has produced data which is skewed and is not valid for statistical testing. Further research will ensure that some control is possible over the research environment (e.g. to control confounding factors) and yet maintain as near-natural usage as possible.

5. Conclusion and further work

This pilot study has identified some interesting similarities and differences relating to the porgress and usage of the system for learners of different preferred modal styles. A proposal has now been produced to build an adaptive learning environment with a range of personalisation utilities. This will enable a further study to observe more closely the specific stimuli that lead to users with each modal learning style preference performing better than others and to track usage of these specific stimuli.

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