Personality and learning preferences of students in design and design-related disciplines

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Abstract
This paper explores the thinking and learning styles of art-based design students, and reports a personality survey of typical design students at two UK universities. Where teaching and learning styles do not match, there may be cognitive dissonance leading to poor knowledge transfer. Students state that they have such problems with their studies.

Designers' strategies for problem-solving are different to many other professionals, and an intuitive way of working is preferred strongly. It is demonstrated that designers also have related styles of learning, and suitable treatments are proposed to match teaching and learning.

Though designers' learning seems to be well matched to the teaching mostly employed in UK design schools, concern is expressed about current economic and other pressures which threaten its continuance.

Introduction

The study reported here arose from an investigation into the possibility of matching styles of teaching with styles of learning by art-based design students in the context of adaptive computer aided learning (CAL). This led to an examination of the personality characteristics of designers, cognate professionals, and others. In the course of this study, some fundamental differences were revealed in the worldviews adopted by different occupational groups which affect instructional models, type of content, and control of the learning process.

Differences in design thinking

Creativity is central to designers' thinking, though their methods of working and their attitudes toward the solving of problems may be very different to other professionals.

For example, in a study of problem-solving[1] it was found that architecture students approached the task by a willingness to propose solutions, and only after deciding on a solution did they analyse it for underlying rules or principles. Science students, on the other hand, proceeded step-by-step to analyse the problem and seek to understand the principles involved. Hudson proposed two kinds of problem-solving behaviour — divergent and convergent thinking[2]. Divergent thinking is characterised by ideation and a fluency with unusually associated ideas: it moves away from the known and predictable. Any one of the ideas generated may be acceptable. This kind of thinking seems natural to designers, and is highly productive where value is placed on difference for its own sake. Conversely, convergent thinking progresses toward the production of a single, right answer to a problem, and is a style of thinking characterised by a logical, analytical approach to problem-solving. It moves towards the known and the specified. This kind of thinking seems more natural to scientists and technologists. Designers exhibit playfulness and a readiness to generate ideas, and these can sometimes be humorous or ridiculous[3].

Designers' creativity also seems to be linked strongly to intuition. For example, a psychological study of American architects showed the most creative among them to have intuition as a strong preference[4]. A study of RDIs (Royal Designers for Industry) had similar results: these designers reported that, in choosing between various ideas generated, they know when the right idea presents itself, though this process they found difficult to verbalise[5].

Teaching and learning

Study behaviours stem from cognitive preferences which are broadly manifested as personality. Specific learning preferences are called learning styles, and they serve as stable indicators of how learners perceive and interact with learning environments[6]. Though individuals may adopt different learning strategies at times, learning style can be seen as the preferred manner in which information is processed. In the case of designers, it has been proposed that their styles of learning may be linked with their particular styles of designing[7].

Teachers also have styles — these are characteristic ways of teaching which emanate from their own personalities and preferences. Where there is a mismatch between styles of teaching and learning, the student may experience psychological discomfort, and knowledge transfer may be impeded. Students have commented on this mismatch: in structured interviews[8] they have stated that, for example, comprehension may be difficult where a lecturer delivers material at too fast a pace; or that understanding has to keep in synchronicity with the lecture or series — if there is a lack of understanding at a particular point in the linearity of exposition, then understanding gets out of step with teaching and may not recover.

Across various subjects, the nature of tuition varies widely, though it is probable that specific tuition used by subject specialists is broadly appropriate for the students who have chosen to study that subject. A large scale psychometric study of engineering students assessed personality and learning preferences, and compared these results with tutors[9]. The conclusion was that teaching and learning are well matched for most engineering students. However, the study also highlighted that in schools of engineering there is a concentration of certain types of engineering tutor who are likely to teach in styles incompatible with many of their students.

Art and design provision is characterised by project-based studio teaching with a demand for large measures of personal tuition. Recent years have seen a movement towards more lecture-based teaching of greater numbers of students, together with the provision of learning resources to encourage student-directed learning. Under these pressures, thoughts are turning to the provision of more materials delivered through computer networks. If design tuition matches the learning needs of its students, are these changes desirable? Some light may be thrown on the subject by clarifying the position of design students in a general taxonomy of teaching and learning styles.

Measuring styles

The Myers-Briggs Type Indicator[10] (MBTI) has been proposed as a robust tool for the assessment of learning styles[11]. It is a psychometric instrument which operationalises the Jungian theory of psychological types as a self-reporting questionnaire. It measures preferences which reflect the kinds of perceptions and judgments individuals use in interacting with their environment. The instrument is widely used, often in education. It has a large corpus of occupational results published over the past thirty years[12]. The MBTI is arranged as a set of four dichotomised scales.

orientation	**E**	Extraversion	Introversion	**I**
cognitive processes	**S**	Sensing	Intuition	**N**
	T	Thinking	Feeling	**F**
attitude	**J**	Judgment	Perception	**P**

Figure 1: MBTI scales

A brief description of the scales of the instrument is as follows. (The terms used here have specialised meanings arising from the MBTI).

- Extraversion prefers the outer world of people and things. Extraversion types tend to do their best work externally, in action, and are most comfortable interacting with other people and in group working.

- Introversion prefers the inner world of ideas and concepts. Introversion types are most comfortable when working quietly alone, and do their best work reflectively, in their heads.

- Sensing determines how a person takes in information by addressing reality directly through the senses. It focuses on directly observable phenomena, on facts and practicality. Sensing learners prefer to begin with the details and facts, and then move towards concepts: there is also more liking for step-by-step exposition.

- Intuition also determines how a person takes in information, but uses internal sensing using imagination. It focuses on ideas and associations, together with possibilities and what might be. Intuition learners prefer to begin with the big picture, and then move towards details and facts. (Note that iNtuition is denoted by the letter 'N').

- Thinking forms conclusions about information, and prefers analytical, logical, evaluative and objective modes of thought. It is an impersonal and detached basis for choice. Thinking types prefer exemplars which are based around things or products.

- Feeling also forms conclusions about information, but acts by appreciation and utilises more personalistic, subjective values. Feeling types prefer to make choices based on personal values. They prefer exemplars which are based around people.

- Judgment emphasises thought which is decisive, planned and orderly. It is associated with a need for closure and the settling of things. Judgment types prefer more structure in lessons.

- Perception is a preference for keeping all options open. It is associated with a more flexible, spontaneous and adaptable approach. Perception types are more likely to prefer an exploratory learning environment that offers choice.

The dynamic interplay of these scales provides a total of 16 types denoted by a four character label. Each type has a dominant process which represents the primary view through which the individual's world is sensed and handled. These will be shown underscored. For example, an ESTJ would have a predominantly thinking view, whereas an ESTP would prefer to primarily utilise sensing.

Specific learning preferences which arise from a wide range of reported correlational studies have been associated with the MBTI scales[13]. The scales which have the most relevance to learning are: sensing•intuition and thinking•feeling. The matrix of psychological types shown in figure 2 has been restructured in order to reflect learning preferences. It will be observed that there is a wide range of such preferences.

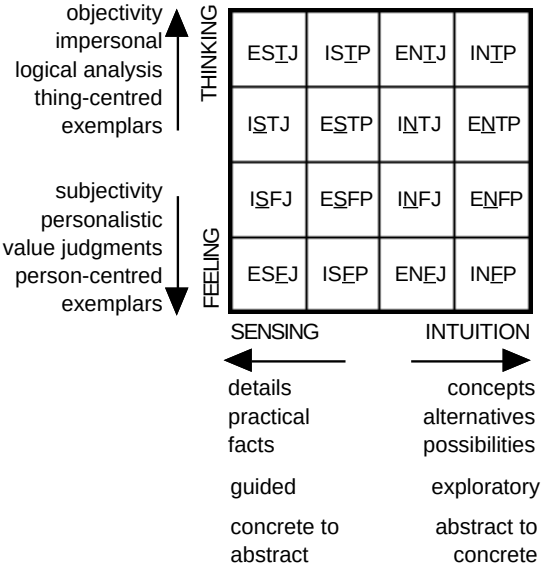

Figure 2: Learning preferences

The horizontal axis of this matrix reflects:

- a differential from the more factual and detailed to the more ideational and conceptual
- an instructional model which is either concrete-to-abstract, or is abstract-to-concrete
- a differential from guided learning to more exploratory learning

The vertical axis of this matrix reflects:

- a differential from objective analysis to more subjective values
- a differential from thing-centred examples to people-centred examples

general population

ESTJ 9.9	ISTP 6	ENTJ 3.9	INTP 2.1
ISTJ 19.1	ESTP 4	INTJ 3.3	ENTP 2.1
ISFJ 15.6	ESFP 5.4	INFJ 3	ENFP 3.7
ESFJ 9.1	ISFP 6.7	ENFJ 2.3	INFP 3.8

business managers

ESTJ 20.7	ISTP 4.4	ENTJ 8.8	INTP 3
ISTJ 23.8	ESTP 3.9	INTJ 6.5	ENTP 4.2
ISFJ 6.5	ESFP 1.2	INFJ 2.4	ENFP 2.9
ESFJ 5.9	ISFP 1.2	ENFJ 1.6	INFP 3

mechanical engineers

ESTJ 18.2	ISTP 6.5	ENTJ 2.6	INTP 3.9
ISTJ 19.5	ESTP 3.9	INTJ 6.5	ENTP 9.1
ISFJ 2.6	ESFP 0	INFJ 3.9	ENFP 3.9
ESFJ 3.9	ISFP 3.9	ENFJ 5.2	INFP 6.5

Figure 3: General population; business managers; and mechanical engineers

Occupational samples

In any large occupational group it is likely that all 16 types will be found. However, individuals tend to cluster in certain types or groups of types. Some examples are shown in the diagrams below of psychological types in design-related and other occupations. In an effort to more easily visualise the data presented, a darker tone denotes more individuals in that particular group. In the following diagrams each box shows the type, and the percentage of persons of that type in the sample.

Firstly, figure 3 shows results for a general population, and for non-design occupational groups with which designers are likely to come into contact eg. business managers and mechanical engineers[12].

There is not an even distribution across all 16 MBTI types. In a general population three quarters cluster in the left-hand half of the matrix, ie. a general population comprises mainly sensing types. A majority of business managers cluster in the upper half of the matrix, with a concentration of two types: therefore business managers are also mainly sensing types, and three quarters of them prefer thinking. Mechanical engineers show similar preferences to business managers, but are more dispersed.

Secondly, samples for professionals similar to designers are shown in figure 4. These are architects and fine artists[12]. Over three quarters of representative architects in this

Figure 4: Representative architects; fine artists

representative architects

ESTJ 5.6	ISTP 0	ENTJ 6.4	INTP 12.1
ISTJ 7.3	ESTP 0	INTJ 20.2	ENTP 4.8
ISFJ 3.2	ESFP 0	INFJ 9.7	ENFP 6.4
ESFJ 0.8	ISFP 0.8	ENFJ 5.6	INFP 16.9

fine artists

ESTJ 0.8	ISTP 0	ENTJ 8.8	INTP 10.5
ISTJ 1.7	ESTP 0.8	INTJ 7	ENTP 0
ISFJ 2.6	ESFP 0	INFJ 16.7	ENFP 14
ESFJ 1.7	ISFP 0.8	ENFJ 12.3	INFP 21.9

sample prefer intuition. A larger majority of the artists (91%) have intuition as a preference, but nearly three quarters also prefer feeling. These samples are quite different to either a general population or to the non-designer samples.

Design students

No data were available for representative design students, so a study of a small sample of design undergraduates was undertaken in two UK universities which offered typical art-based undergraduate design courses in both 2D and 3D studies. Samples were restricted to whole subject-specialist cohorts in their first year of study. A total of 71 students was assessed. The subject specialisms covered were product design; interior design; graphic design; furniture design; and design marketing. The results are shown in figure 5.

design students

ESTJ 4.2	ISTP 2.8	ENTJ 9.9	INTP 5.6
ISTJ 1.4	ESTP 2.8	INTJ 5.6	ENTP 26.8
ISFJ 1.4	ESFP 7	INFJ 2.8	ENFP 15.5
ESFJ 0	ISFP 1.4	ENFJ 5.6	INFP 7

Figure 5: UK design students

Over three quarters of representative design students have preference for intuition (79%) and a majority also prefer perception. A quarter of design students are of one type, ENTP.

Position of occupational groups

The broad disposition of occupational groups is shown in figure 6. This diagram may be compared directly with the proposed learning style treatments (cf. figure 2).

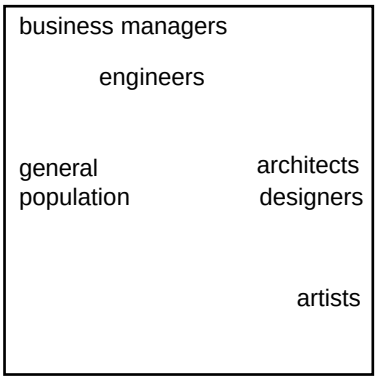

Figure 6: Occupational groups

Conclusion

It has been demonstrated that the learning styles of individuals differ, and that there are styles which are characteristic of occupational groups. However, not all members of a group will share exactly the same style. One kind of treatment is therefore insufficient to cater for the needs of an entire group. A simple matrix of learning styles has been outlined. Broadly, designers prefer teaching which:

- begins with the big picture, with concepts, and then explains details
- is focused toward future possibilities and gives alternative viewpoints
- has lightweight structure, allowing for guided exploration
- mostly shows objective data, is logical and analytical, and is based on exemplars showing things. (However, about a third of designers will be happier with more subjectivity, a person-centred approach, and the utilisation of value judgments).

By comparison, the non-design samples prefer teaching which:

- begins with details and facts, and then generalises
- offers more guided instruction which proceeds step-by-step

There are several implications which arise from these findings, and which impinge upon design education. Designers are quite different to a general population, and also different to many colleagues from other disciplines.

It is interesting to note that the more exploratory and flexible manner of designers' learning seems to be well matched to the adaptable, project-based form of teaching

which is mostly employed in UK design schools. However, as no single treatment is suitable for all designers, it follows that teaching should be adaptive, particularly if it is computer-based. Furthermore, if students already find their human tutors difficult, by comparison they may find machine tutors quite hostile. Inflexible, programmed learning would seem to be unsuitable for design students.

Professional designers regularly deal with those from the world of business, often at management level. A deeper understanding of differences between these groups might lead to improved communications between designers and management. Furthermore, in teaching technology or business studies to designers, it is most likely that the style of teaching (by a subject specialist) will not be in a suitable style for the majority of design students.

Designers' creativity seems inextricably bound up with their particular personality types. Intuition seems to be at the core of the designers' special brand of creativity. The design students' largest grouping is ENTP. Of this type Myers[10] has written:

> For example, those ENTs who find intuition more interesting than thinking will naturally give intuition the right of way and subordinate thinking to it. Their intuition acquires an unquestioned personal validity that no other process can approach. They will enjoy, use, and trust it most. Their lives will be so shaped as to give maximum freedom for the pursuit of intuitive goals. Because intuition is a perceptive process, these ENTs will deal with the world in the perceptive attitude, which makes them ENTPs [...] They will consult their judgment, their thinking, only when it does not conflict with their intuition

Though much attention has been paid to formal methods for problem-solving, these have not gained much currency in design studios. Perhaps these rigid methodologies are a poor cognitive fit with the designers' looser and more playful way of working.

It is also interesting to speculate about the significance of these findings in the context of changes in education, particularly at a time when traditional studio based teaching and the nurturing of an intuitive way of working are under threat — both from advances in information technology, and the harsher economics which may affect the delivery of higher education programmes in the future.

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