

LEARNING STYLES OF 3RD YEAR GENETICS STUDENTS AND THEIR AFFECTION AND PERCEPTION OF EFFECTIVENESS OF A RANGE OF INSTRUCTIONAL MODES

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ABSTRACT

Different students come into our classes with different past learning experiences with diverse backgrounds. They have acquired their preferred way for assimilating information and have settled into a mode of learning that is most effective for them. Teaching them in using a single dimensional approach inevitably will only facilitate effective learning to a small population of the student cohort. A questionnaire was administered to ascertain the range of preferred learning styles of a cohort of third year genetics students in an effort to understand the diversity of their learning styles and to fine tune instructional modes for the coming year. The questionnaire assessed the preferred sensory modes in which the students choose in the way they perceive, process and acquire information. Through a series of lectures, use of multi-media and guided inquiry case studies, group discussion and group presentation, students were also able to provide additional feedback as to the mode of instructional activity which they perceived that they enjoy and is most effective in learning human molecular genetics. This paper analyses the correlation of gender and the different learning styles of these students, the preference and perceived effectiveness of a range of instructional activities. Based on these findings a number of recommendations for improvements to instruction are also discussed.

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INTRODUCTION

Different students have different preferred learning styles. Understanding the diversity in the way third year genetics students learn, will allow fine tuning of instructional modes employed. As students come from a broad spectrum of different age groups, culture, ethnicity, learning preparedness and learning experience, it is important that instructors understand the range of learning styles and design their teaching activities to help meet the diverse ways in which their students learn in order to maximise learning outcomes in their class (Lujan & DiCarlo, 2006; Dobson, 2010). Every learner approaches learning in a complex manner but researchers have found that they usually have, through their past experiences and individual differences, acquired a preferred manner in which they most effectively perceive, process, store and recall information. One way of characterising the different learning style is to ascertain their preferred sensory mode in which they employ to acquire information; which can be categorised as visual (V), auditory (A) or kinaesthetic (K) (Tanner & Allen, 2004; Lujan & DiCarlo, 2006). Visual learners are more likely to prefer information presented in diagrams, charts, figures and video clips while auditory learners prefer to listen and having the opportunity to discuss and to vocalise their ideas. Kinaesthetic learners are those that enjoy and learn most effectively when they are able to be involved and engaged physically through doing, touching and using objects and equipment. Fleming has included an additional learning style to describe those that prefer to use textual materials) (Fleming, 1995; Leite, Svinicki, & Shi, 2010); categorising learners who prefer reading and writing as the R learners. In this study we examine the preferred learning styles in which third university students used to learn human molecular genetics and what they perceived as the type of instructional activities that they like and were effective in helping them learn. We have only included the three sensory modes of learning (VAK) and have left out the R category. It is also well known that while most students employ more than one mode when they are receiving information, some use a particular mode more effectively and predominantly over the other.

METHOD

We administered a questionnaire to a cohort of third year genetics students to help identify the students' preferential mode of receiving information. The class has 99 students studying Human and Molecular Genetics at La Trobe University, Victoria. 81 students (82%) returned the completed questionnaire. The VAK questionnaire was adapted from Idpride (obtained from a website that helps

students understand their own learning style, see Appendix A), which has 30 questions in which students have to indicate whether they agree or disagree with the statement over a 5 point scale. A second feedback (see Appendix B) instrument was administered at the end of the course to determine students' affective preference and perception of the effectiveness of the 7 different instructional activities. 71 students returned completed forms.

PROCEDURE

The students received a series of 12 lectures on the genetics of human diseases in which various instructional materials were employed including the use of diagrams, figures videos and electronic media. They were also required as part of their practical class, to carry out an investigative case study using a guided inquiry approach. They were to determine and identify the name of the genetic disease of a case through a step wise release of background, family, diagnostic and clinical information and laboratory test results. The guided inquiry case study was carried out in groups of threes which required the members of the group to discuss and articulate their understanding of the information released and how they come to the conclusion in identifying the genetic basis of the case given to them. They were then asked to conduct a literature search to obtain further reading materials and journal articles to be read and to prepare a poster presentation. A simulation of a mini conference over two days was staged in which each group were to stand by their poster and to give an 8-10 minute presentation followed by 5 minutes of questions and answers carried out by a panel of three judges which were the instructors of the class. Marks were also collected from their peers and teaching assistants, to evaluate their posters and a prize was awarded to the best poster for the day.

ANALYSIS

At the end of the poster presentation, a second feedback instrument was used to collate students' feedback concerning their perception of their preference and effectiveness of the different stages of teaching and instruction and instruction activity.

To obtain their preferred learning style the scores from the statements that described them in the way they process and receive information were tallied, with the scores obtained for each of the three categories of learning styles for each person. This score is then converted to percentage. Percentage scores greater than 33.3% is considered an indication of a preferred learning style. When more than one category of learning styles scores greater than 33.3% the person is considered as having a bi-modal learning style preference.

RESULTS

DIVERSITY OF PREFERENCE OF DIFFERENT LEARNING STYLES

The cohort of students was made up of 30.76 % males and 69.24% females. Their ages range from 19 years old to forty years old with 8% of the class being international students. An analysis of the VAK learning style preference of the cohort reveals that the most preferred learning style is Visual-Kinaesthetic (25.9 %) followed closely by the Visual-Auditory (24.7%). Those that indicated Visual as the most preferred learning style made up 18.5 % of the class (see Figure 1). If we were to combine all those that either has Visual as their only or one of two preferred modes of learning, the percentage adds up to 69.1%. The percentage of those that indicated Auditory as their only or one of two modes of learning was 46.9% while those that indicated Kinaesthetic as their only or one of two modes of learning was 50.5%.

To determine the percentage of those that are comfortable with all three modes of learning, those that had scores of 35 and above for all three categories (out of a total possible score of 50, as there are 10 statements for each category) were tallied and the percentage was found to be 19.7%. On the other hand, those that has indicated that they prefer only one particular mode of learning whether it is V (18.5%), A (6.2%) and K (8.6%), adds up to 33.3%.

LEARNING STYLE PREFERENCE ACCORDING TO GENDER

To determine if there is a difference between males and females in terms of their preference for learning style, the percentage of each category were divided up according to gender. Figure 2 shows that 41.7% of all males (10 out of 24) and 19.3% of all females (11 out of 57) in the class chose VK as their preferred learning style. In comparison 28% of all females (16 out of 57) and 16.6% of all males (4 out of 24) chose VA as their preferred style of learning.

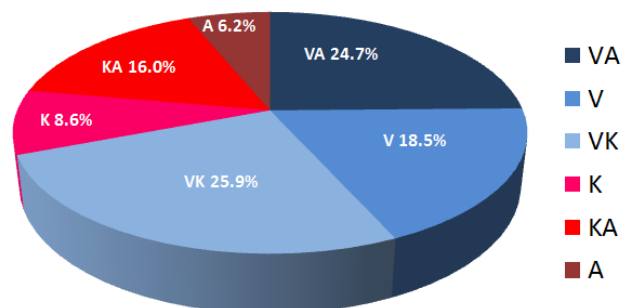


Figure 1: Percentage of students preferring predominantly Visual (V), Auditory (A), Kinaesthetic (K), Visual-Auditory (VA), Visual –Kinaesthetic (VK), Kinaesthetic-Auditory (KA) modes of information presentation. Note also that those that include visual as their predominant one V, VK and VA together forms 69.1% of the whole class.

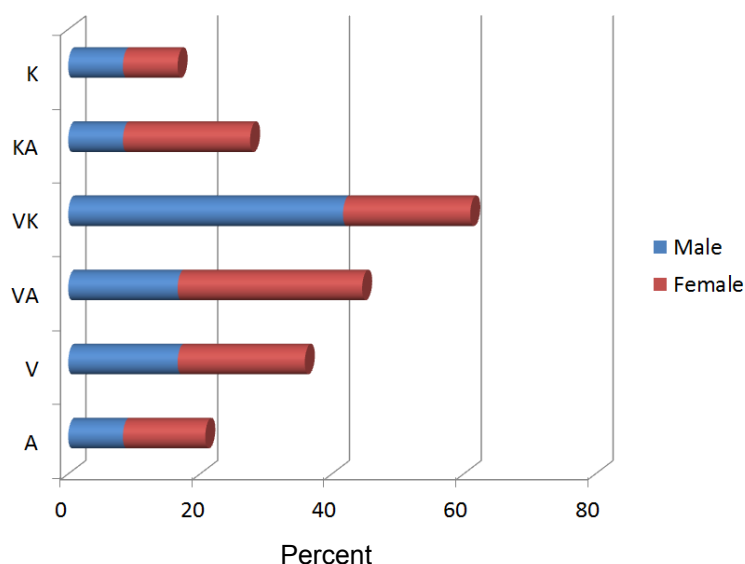


Figure 2: Preferred Learning styles divided according to gender

It was found that 8.3% of males and 8.7% of females preferred K as their learning style while 8.3% of males and 19.3% of females chose KA as their preferred learning style. A very high percentage of males (41.7%) chose VK as their preferred learning style compared to females (19.3%). In contrast, more female (28.0%) chose VA as their preferred mode of learning compared to males (16.6%). Of those that chose V as their preferred mode of learning, 16.6% were males and 19.3% were females. Finally more females (12.5%) chose A as their preferred mode of learning compared to males (12.5%).

STUDENTS' PREFERENCE FOR DIFFERENT INSTRUCTIONAL ACTIVITIES AND THEIR PERCEPTION OF THEIR EFFECTIVENESS

Out of the seven different instructional activities, two stood out to be most popular with 52 of 71 (73.2%) students agreeing that they like (agree and strongly agree) the lectures and 54 out of 71 (76.1%) agreeing that they like the multimedia and video clips used (see Figure 3). The most unpopular instructional activities were the group presentation (23.9% dislike) and group discussion (26.8% dislike). The Guided Inquiry activity also was well liked (60.5% like) but the reading of research articles and journals which they have to do to prepare for the presentation was not too popular (18.3% dislike). Although the reading was not very popular, students indicated that they do learn substantially from them, with 62 % indicating that they "learnt a lot" from the activity (see Figure 4). Lectures and multi-media and videos remain the two activities that they think they learnt the most

from (77.5% and 71.8% respectively). Group discussion also may not be very well liked with only 39.4% liking it, but the percentage of those that indicated that they “learn a lot” from it is 46.5%.

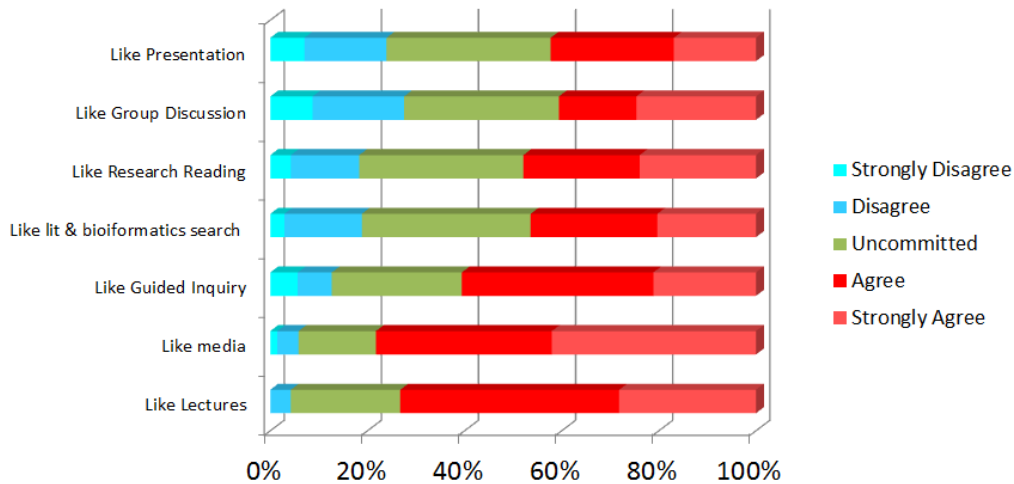


Figure 3: Students' perception of their enjoyment and preference of each of the activities

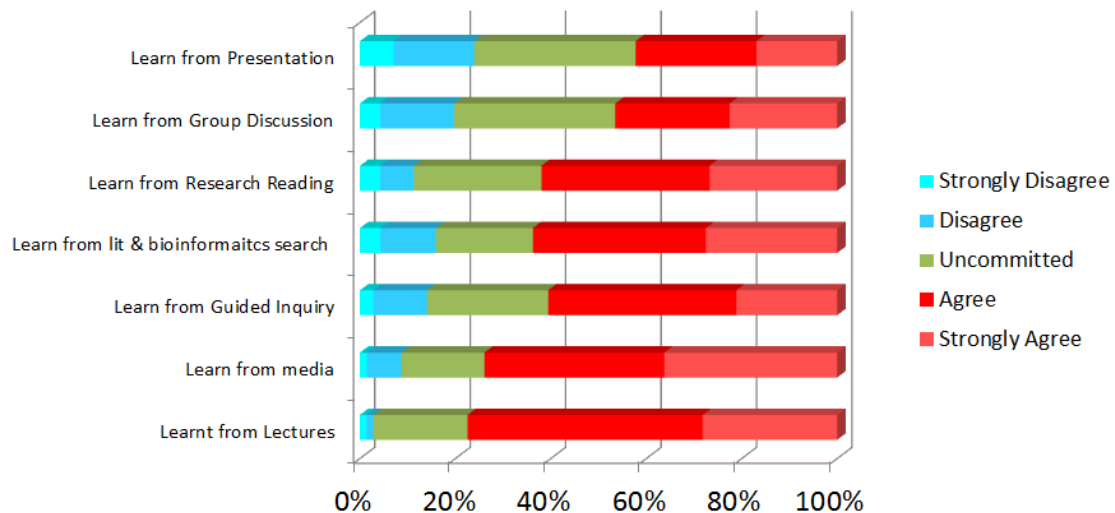


Figure 4: Students' perception of the effectiveness of different instructional activities

DISCUSSION

The VAK questionnaire results clearly revealed that in every class there is a great diversity in their preference for different learning styles. In this cohort of third year genetics students, they would have been through three years of lectures and practicals and would be used to a range of different instructional approaches but it is still evident that some (33.3%) are indicating that they are more likely to receive and process information effectively in predominantly one particular sensory mode. Clearly, to achieve maximum learning outcome, there must be diversity in instructional approaches.

Taking into consideration that 69.1% of them indicated visual learning mode as their only or one of two of their preferred mode of learning, the instructional materials should be amply supported by images, visuals, figures, diagrams, and videos which is also evidently supported by the fact that they both prefer and think they learn effectively from instructional activities using such resources. Approximately half the respondents (50.5%) indicated that kinaesthetic mode of learning is their only or one of two of their preferred learning style. This emphasises the need to provide hands-on participative learning activities to help these students learn effectively. It is encouraging to note that there are some who are able to learn in all three different learning styles. Once the students had

discovered their preferred mode of learning, they can be equipped with skills to convert learning materials suitable to their preferred modes; they can also be taught to stretch their ability to diversify their learning style preference (Felder & Soloman, 2000, Graf & Kinshuk, 2009, Schiaffino, Garcia, & Amandi, 2008).

In this study the results show that there is approximately equal number of males and females that preferred the K and the V mode of learning. More females prefer the KA, VA and A while more males than females prefer the VK mode of learning. This seem to suggest that females are relatively more comfortable with auditory learning modes that males. Although more studies need to be carried out to confirm these gender differences in learning styles, and caution needs to be exercised to prevent over interpretation of these results, nevertheless this study and others (Slater, Lujan, & DiCarlo, 2007; Wehrwein, Lujan, & DiCarlo, 2007; Dobson, 2010) provide some preliminary indication that different instructional approaches would help males and females learn effectively and would benefit them differently.

It is not always possible and not advisable to tailor-make instructional activities to suit the students just because it is something that students particularly like (Felder, Felder, & Dietz, 2002). Some instructional modes may be popular but may not be the most effective way to learn a particularly topic or concept. It is also important to note that students need to learn in ways that they do not prefer so that they can broaden their range of learning skills and will not be dependent on only one preferred learning style (Felder et al., 2002). This study shows evidently that there are some instructional activities that are not popular like reading research articles but were very effective in ensuring that productive learning take place. Certain other instructional activities like group discussion and group presentation enables specific skills to be learnt even when they are not popular and therefore necessary. Lectures continue to be the most popular instructional modes as it is effective, focused and time efficient (Lammers & Murphy, 2002). It is probably popular because students are used to this mode of learning. Nevertheless it is useful that in delivering the lecture, the instructor includes ample illustrations, visuals, diagrams, videos and figures and ensures that students are actively engaged (Aldahmash & Abraham, 2009). Hands-on practicals and discussions continue to be justifiably essential to help students learn, particularly certain skills that cannot be acquired in any other way (Abrahams & Millar, 2008).

CONCLUSION

This study provides insights into students' learning styles and their preferred mode of instruction. In this cohort of third year genetics students, the visual mode of learning stands out to be the most preferred. Thus instructional approaches should take that into consideration. Instructional activities must be designed to help as many in class to learn as much as possible and while there are certain instructional activities that are popular with the majority of students, they themselves are aware that they will learn a lot from some activities that they may not like very much. As instructors in a genetics class, as one sits down with the teaching team to review and redesign the course, it is useful to gather information from the cohort to help the students understand themselves; with regards to their learning styles and to help the instructor to introduce a diverse range of activities to allow effective learning of all key concepts and skills in the curriculum (Allers, 2010).

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APPENDIX A

MULTIPLE INTELLIGENCE and LEARNING STYLES (adapted from Idpride.net)

Student ID : _____

The score is 1-5, (5: that's me, 4: sometimes I like that, 3: kind of, 2: unlike me, 1: never like that)

1. I feel the best way to remember something from a lecture is to picture it in my mind
2. I follow spoken directions better than those given in a handout
3. I prefer listening to a lecture than read the material in an article
4. I am constantly fidgeting and restless in class
5. I prefer explanations of concepts in the form of diagrams, graphs, or maps
6. I am pretty skilful with my hands and love to repair things
7. I would rather listen to the radio than read a newspaper
8. I prefer information to be presented visually, (e.g. on the board or on powerpoint)
9. I usually prefer to be standing up and moving about while working
10. I follow written instructions better than oral ones
11. I am skilful at presentation using graphs, charts, and other visual displays
12. I am excited and animated when communicating what I want to say
13. I frequently sing, music is frequently in my head and I hum or whistle to myself
14. I am excellent at finding my way around even in new place
15. I am good at putting jigsaw puzzles together
16. I am always active and on the move
17. I love visual arts and excel in it
18. I enjoy and well in sports
19. I'm an avid collector
20. I like to take notes during verbal discussions/lectures to review later
21. I am verbally articulate and enjoy a discussion or a debate
22. I find using and follow directions on maps easy
23. I remember best by writing things down or drawing pictures and diagrams
24. I need to watch a speaker's facial expressions and body language to fully understand what they mean
25. I frequently use musical jingles to learn things
26. I often talk to myself when alone
27. I would rather listen to music than view a piece of art work
28. I need to actively engage in an activity or a practical to learn how to do it
29. I like telling jokes, stories and analogies to demonstrate a point
30. I am warm and affectionate and frequently touch others as a show of friendship

APPENDIX B

Student number _____

Feedback regarding final Genetic disorder case study project.

	Teaching and learning approach	I learnt a lot from this stage 1- strongly disagree 5- strongly agree	I enjoy and prefer this approach 1- strongly disagree 5- strongly agree
1	Lectures regarding genetic disorders	1—2—3—4—5	1—2—3—4—5
2	Media (video clips of disorders)	1—2—3—4—5	1—2—3—4—5
3	Guided inquiry (investigative case studies)	1—2—3—4—5	1—2—3—4—5
4	Literature search of clinical disorders	1—2—3—4—5	1—2—3—4—5
5	Reading and understanding of genetic disorders from text and journal articles	1—2—3—4—5	1—2—3—4—5
6	Group discussion and preparation of presentation	1—2—3—4—5	1—2—3—4—5
7	Group presentation	1—2—3—4—5	1—2—3—4—5