



Can the learning styles of surgical residents impact their capacity to succeed in different learning environments? A case study

K. Brandon Lang¹, Todd F. Hoover², Marie Hunsinger³, Mohsen Shabahang³

¹Sociology, Social Work and Criminal Justice, Bloomsburg University, Bloomsburg, PA 17815

²Early Childhood and Adolescent Education, Bloomsburg University, Bloomsburg, PA 17815

³General Surgery, Geisinger Medical Center, Danville, PA 17822

ABSTRACT

Objective: Fleming developed VARK (visual, aural, read/write, and kinesthetic) as an acronym to describe different learning styles. The purpose of this study is to identify the particular teaching settings that are most and least conducive to learning for VARK surgical residents and attending physicians.

Methods: This is a qualitative and quantitative study based on focus group data and anonymous questionnaires. Focus groups were conducted with 27 residents and attending physicians in the General Surgery Department. Respondents were divided into five different groups (interns, mid-years, chiefs, pre-duty hour attendings, and post-duty hour attendings). During the focus groups, short questionnaires were also administered to the respondents.

Results: Overall, both residents and attending physicians felt that it would be ideal to increase the time spent in certain learning environments, such as the operating room and simulation lab. There was not a significant difference in responses among the five groups. In addition, the results show that the different learning styles of respondents inform the ideal amount of time they should spend in each learning environment. More specifically, kinesthetic learners feel more time should be spent in the operating room (41.5% of the time), clinic (10.9% of time), and simulation lab (7.2% of time). Conversely, they feel that less time should be spent in lecture (7.4% of time) and in group-learning settings (3.4% of time) compared to the other three groups of learners.

Conclusion: These findings can help explain why the same learner can excel in one learning environment and not in others. This research builds on the finding that different types of learners find some learning environments to be more conducive to learning than others.

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Introduction

The term “learning style” refers to the way that people gather, organize, and make sense of information. According to Murrell and Claxton [1], learning styles are influenced by people’s personality characteristics, ways that they process information, social interaction with others, and instructional preferences. People’s instructional preference is an important component of learning and is based on the teaching methods that work best for them [2]. For example, some people learn best through

graphic representation, while others prefer listening, reading or direct experiences.

Neil Fleming has long studied people’s learning styles and developed the VARK model [3]. VARK is an acronym that stands for Visual, Aural, Read/write, and Kinesthetic and establishes that people learn in one of four distinct ways. Visual learning, for example, describes people who learn through charts, graphs, diagrams, and other images that depict a concept or phenomenon [4]. Aural learners have a preference for information that is spoken

Contact K. Brandon Lang ✉ klang@bloomu.edu 📧 Sociology, Social Work and Criminal Justice, Bloomsburg University, Bloomsburg, PA 17815.

in classrooms, discussions with others and oral presentations [4]. Read/write learners have a preference for information that is displayed in books, texts, and manuals [4]. Last, kinesthetic learners learn by doing and have a preference for experiential and practical techniques [4].

Two dozen or so academic studies have examined the learning styles of medical, nursing, and dental students in the United States, Turkey, Iran, and numerous other countries [5]. Although the consensus is not unanimous, most of these studies found that medical, nursing, and dental students have a strong orientation toward kinesthetic learning [5–13]. Similarly, in their meta-study of 20 research papers, Khanal et al. [14] also found that the kinesthetic learning is the most common learning style among the medical students, physician residents and other medical learners. Khanal et al. [14] also found that women are more likely than men to be uni-modal, rather than multi-modal learners, and that learning styles can change as medical students' age.

Perhaps the greatest strength of Khanal et al. [14] research is that they examine the connection between the learning styles of medical students and their overall degrees of academic performance. The authors identify three studies that have found that medical students achieve higher scores when instruction matches, rather than does not match, their VARK learning style preferences [14]. Three studies conducted in Turkey, India, and Spain are also identified, however, that do not report any correlation between test scores and students' VARK learning preferences.

Five studies have examined the learning styles of surgical residents. All of these studies were conducted in the United States and show that the majority of surgical residents surveyed are kinesthetic learners. Pang et al.'s [15] study, for example, found that 80% of surgical residents were kinesthetic learners [15]. They also found that learners who correctly identified their learning styles scored better on the ABSITE exam [15]. Kim and Gilbert's [16] research establishes that 76% of surgical residents in their study had some degree of kinesthetic learning. They also found that the VARK learning styles of applicants impacted their USMLE step 1 and step 2 scores but had no effect on their class rank, interview scores, or final ranks [16]. In a follow-up study, Kim et al. [17] offered two very interesting conclusions. First, surgical residents with a dominant VARK learning style had higher ABSITE scores than residents without one [17]. Second, residents whose

dominant VARK learning style was aural scored lower on the ABSITE than their peers [17].

Kim et al. [18] conducted a multi-institution study that involved administering the VARK learning inventory to 140 people who interviewed for positions in one of three general surgery residency programs. Results from this research show that the VARK preferences of general surgery applicants are different than they are for the general public, there are no overall differences in USMLE Step 1 and Step 2 scores according to VARK preference but that applicants with read/write preferences had statistically significantly higher USMLE Step 1 scores than those with multi-modal preferences [18]. In another multi-institutional study conducted at five institutions, Kim et al. [19] found that respondents with higher aural learning tendencies were more likely to have higher ABSITE percentile rankings, answer more questions correctly, and have higher standard scores than the other respondents. The authors conclude that the VARK model can help to improve the learning efficiency among residents [19].

Using survey and focus group data collected at a large teaching hospital in central Pennsylvania, the purpose of this study is to identify the particular teaching settings that are most and least conducive to learning for VARK surgical residents and attending physicians.

Methods

This research was conducted in the fall of 2015. Upon obtaining IRB approval from the hospital, focus groups were conducted with residents and attending physicians in the General Surgery Department at Geisinger Medical Center in Danville, PA. All of the focus groups transcriptions and questionnaires are anonymous and it was made clear to respondents that they could suspend their involvement at any time.

The focus groups were divided based on the experience level of the respondents. As such, there were three groups of residents, including interns, mid-years, and chiefs, and two groups of attending physicians (pre-duty-hours era and post duty-hours). The focus group began with a comprehensive overview of VARK. This was done in order to acquaint the members with Fleming's four learning styles and to prompt discussion about the respondents' individual learning styles. Upon going over VARK, focus group members were asked to reflect upon the learning environments that are best and least suited to their individual learning styles. Each

of the groups lasted about an hour was recorded and transcribed.

During the focus groups, a short questionnaire was administered to each of the participants. This survey asked respondents to use the VARK categories to rank-order their preferred learning styles. They were also asked to identify the actual time and the ideal amount of time that they think should be spent in 10 different learning environments. These include the operating room, clinic, on own, lecture, rounds, PowerPoint, in groups, simulation, sign out rounds, and other. These data were analyzed using SPSS 22.

Fleming made clear in his writings that many people are multi-modal learners [10]. In other words, people are not exclusively aural or visual learners, for example. Rather, people often exhibit combinations of two or more different learning styles. For the purposes of this study, we focused on people's dominant learning style. Fleming also established a multiple-item question set to identify people's learning styles. In this study, we offered in-depth explanations of each of the four different learning styles and asked focus group members to self-identify their predominant learning style and rank order the remaining learning styles as they applied to them.

This study is based on focus groups with 27 residents and attending physicians. Emails were sent to all of the residents and attending physicians asking them to join these focus groups. The focus

groups were all held on weekday afternoons and a meal was provided. Because of schedule conflicts, not everybody was able to participate. Of the 27 focus group members, 19 (70.4%) were residents. All told, 14 (51.8%) of the focus group members answered that their predominant learning style is kinesthetic. With regards to the remaining people's predominant learning styles, 9 (33.3%) answered that they are visual learners, 2 (7.4%) answered that they are aural learners, and 2 (7.4%) answered that they are read/write learners.

Results

Figures 1 and 2 illustrate the actual and ideal amounts of time that residents spend or should spend in 10 different learning environments.

Figure 1 shows that respondents answered that residents spend the most time in the operating room and in clinic and the least amount of time in the simulation lab and doing sign out rounds. Figure 1 shows that working in the clinic, working on their own, attending lectures and conducting rounds accounts for between 10% and 15% of their time.

Figure 2 shows that residents and attending physicians think that it would be beneficial for residents to spend more time in the operating room. In fact, they answered that it would be ideal to essentially double the amount of time that residents spend in the operating room. Both groups also answered that it would be ideal for residents to spend a little more time in the simulation lab. It is also worth noting

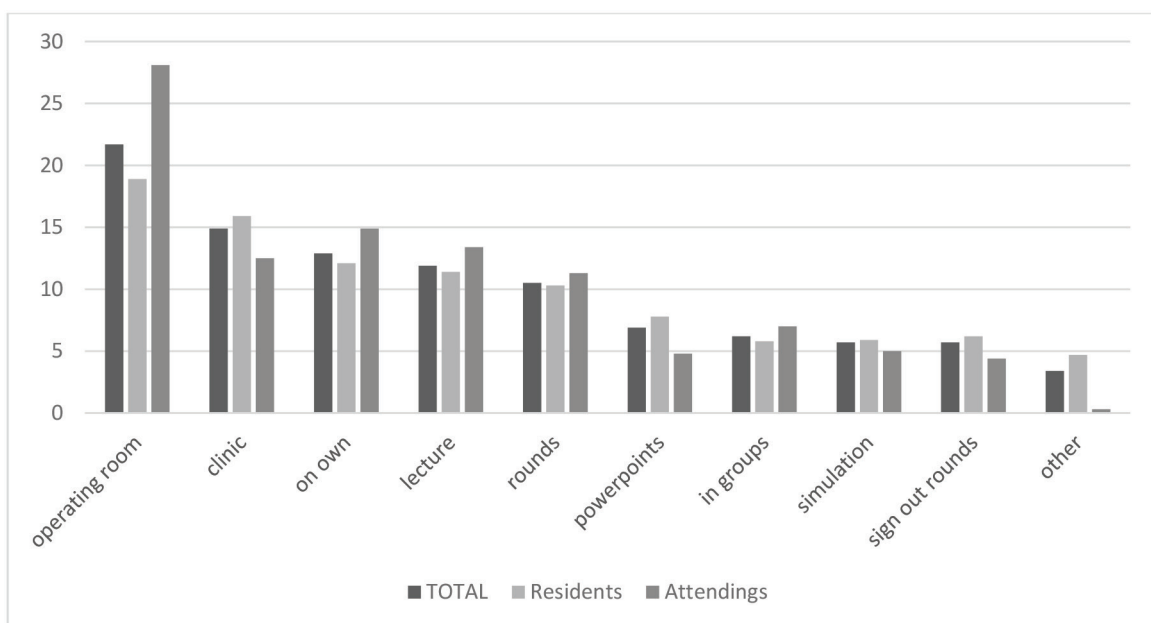


Figure 1. The percentage of time that respondents think residents actually spend per week in 10 different learning environments.

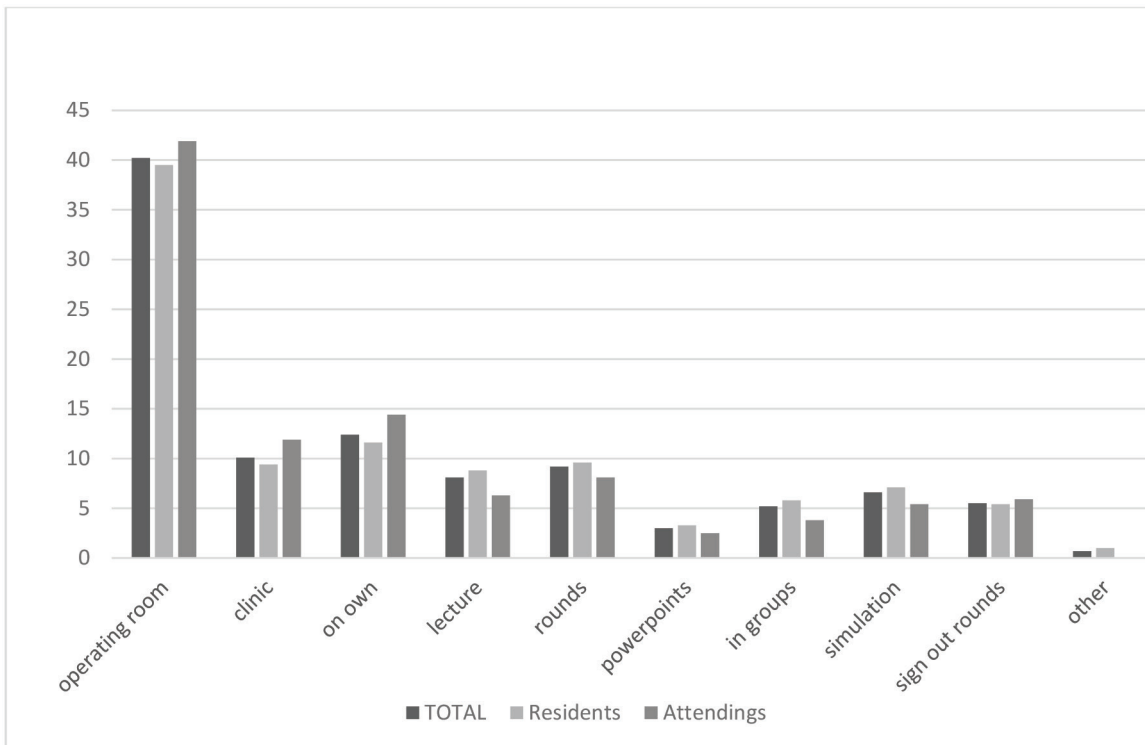


Figure 2. The percentage of time that respondents think residents should spend per week in 10 different learning environments.

that respondents answered that residents would ideally spend almost 5% less of their time in clinic, almost 4% less of their time in lecture and a little less time doing rounds and in groups. Respondents also answered that residents should halve the time that they spend viewing PowerPoint presentations.

The qualitative data garnered in the focus groups supports many of the above findings. Many of the residents really valued their time in the operating room and found that to be the most rewarding learning setting. Upon being asked why it was ideal to spend more time in the operating room, one mid-level resident stated, “Because that is what we do. At the end of the day, when we are done with residency when someone comes to you with a problem, we need to know what we have to do in there. I think our training does not prepare us completely to be able to make those difficult decisions.”

Figure 3 reports the mean scores for each of the ideal learning environments grouped according to the respondents’ predominant learning style. Visual learners devoted the most time to clinic, lecture, simulation, and working in groups than the other learners. This group feels that the least amount of time should be devoted to sign out rounds. Aural learners devoted the most time to clinic, lecture, sign out rounds, and PowerPoint. They think that less time should be devoted to the operating room,

rounds and learning on one’s own. Read/write learners devoted the most time to the operating room and learning on one’s own. They devoted the least amount of time to clinic, rounds, simulation, and PowerPoint. Last, kinesthetic learners devoted the most time to clinic, and rounds and the least amount of time to lecture and learning in groups. These findings demonstrate that the four types of learners in this study think that, ideally, different amounts of time should be spent in the 10 different learning settings that are used in this study.

Table 1 is a logistic regression that predicts the importance of the 10 different learning environments used in this study for kinesthetic learners (coded as 1) and non-kinesthetic learners (coded as 0). Kinesthetic learners responded that the amount of time should be increased for clinic, the operating room, rounds, simulation, sign out rounds, learning on own, PowerPoint, and other learning environments. Kinesthetic learners also answered that the time devoted to lecture and groups should be decreased compared to non-kinesthetic learners. These findings offer support for the view that kinesthetic learners respond more positively to the active learning that comes with interacting with patients and working in the operating room and less positively to the more passive learning that comes with a classroom environment.

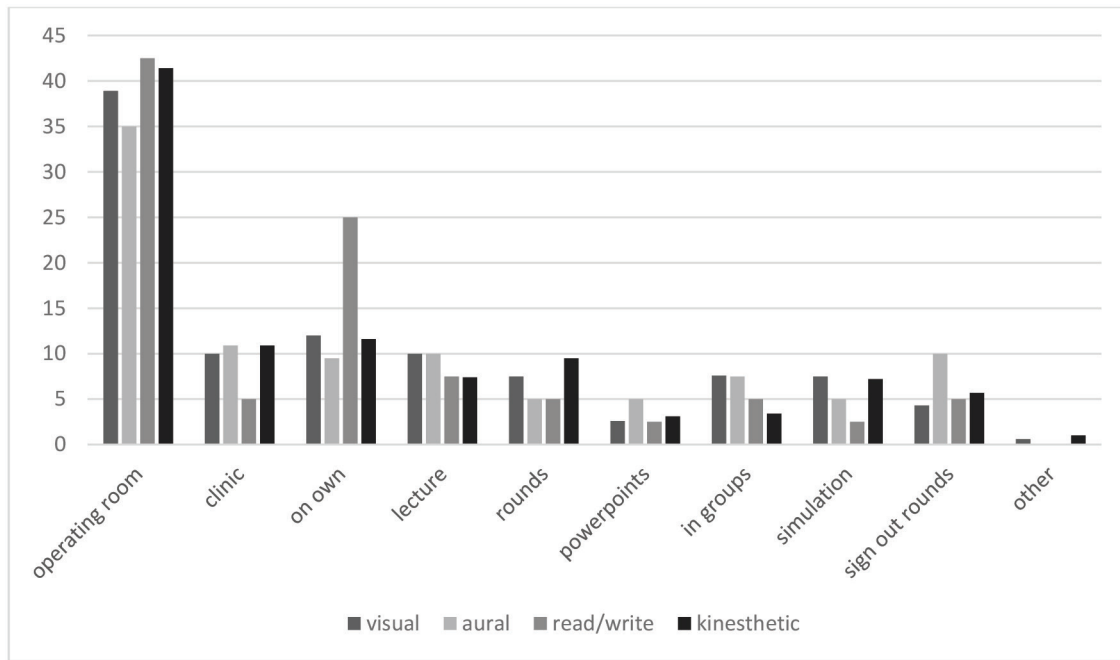


Figure 3. The ideal percentage of time spent in each learning environment based on respondents' predominant learning style.

Table 1. Logistic regression of the effects of different learning environments upon learning style (kinesthetic = 1; non-kinesthetic = 0).

	Independent variables
Operating room	0.061
Clinic	0.107
On own	0.098
Lecture	-0.405
Rounds	0.141
PowerPoints	0.111
In groups	-0.373
Simulation	0.166
Sign out rounds	0.089
Other	0.563
Constant	-3.922

Discussion

Going back to the 1980s, medical educators have studied the extent to which students' learning styles are linked with their overall academic success [20–23]. These studies have used the Lancaster Approaches to Learning Inventory, the Kolb Learning Style Inventory, and other assessment tools to uncover if students' learning styles impact their academic success. As discussed above, a number of studies have also used the VARK categorization scheme to further make sense of this relationship.

This research not only builds on past studies but it also helps to expand our understanding concerning the perceived effectiveness of various teaching and learning settings among residents and attending physicians at a large teaching hospital. More specifically, this research suggests that people's learning styles appear to impact the benefits that they derive from a host of different learning settings. Data from this study show that kinesthetic learners, for example, prefer to spend more time in the operating room more than the visual and aural learners. Similarly, the data show that read/write learners value learning on one's own more than the other kinds of learners.

Ultimately, this information suggests that the different learning styles of surgical residents can impact their capacity to succeed in different learning environments. It makes sense that different learners will prefer different learning environments where a range of teaching styles are likely to be used, material is presented in different formats and the degree of group interaction varies. People's learning styles will also influence how they study for exams, prepare for surgeries and communicate with patients. Although the number of people in this study is fairly small, it provides an interesting snapshot into the lives of surgical residents. This research project has been largely qualitative and the findings are not intended to necessarily be generalizable. Nevertheless, the main purpose of this

study is to capture insights into the lives of surgical residents that can eventually be used to help offset some of the negative effects of burnout, stress, desire to quit, and other challenges that many of today's medical trainees experience.

Perhaps, it would be a good idea for General Surgery Departments to administer VARK inventory questionnaires to residents and attending physicians in order to help match them with learning environments that match their particular learning styles. If someone prefers learning on one's own, maybe more time should be allocated for that. Similarly, if someone does not get as much out of simulation, maybe s/he could spend more time in another setting. Of course, further research on this topic is needed. Future studies could also be conducted to see if and how the tailoring of teaching and learning criteria impact residents' test scores, surgical capabilities and confidence levels, among other things.

Conclusions

Based upon this study, it can be seen that the learning styles of general surgery residents and attending physicians impact their capacity to make the most of different learning environments. As discussed above, read/write learners think that more time should be devoted to learning on one's own while kinesthetic learners think that less time should be devoted to lecture. Similarly, visual and aural learners think that more time should be allocated to lecture than the other two types of learners.

Does this mean that the schedules and responsibilities of residents should be changed? Of course, not. Rather, it helps to explain why many residents will perform at a higher level in some educational settings compared to others. This, for example, helps to explain the same residents may appear to be bored and aloof in one educational setting, confident, and inspired in another and even overwhelmed and tentative in another.

Conflict of interests

The authors declare that they have no conflict of interest.

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