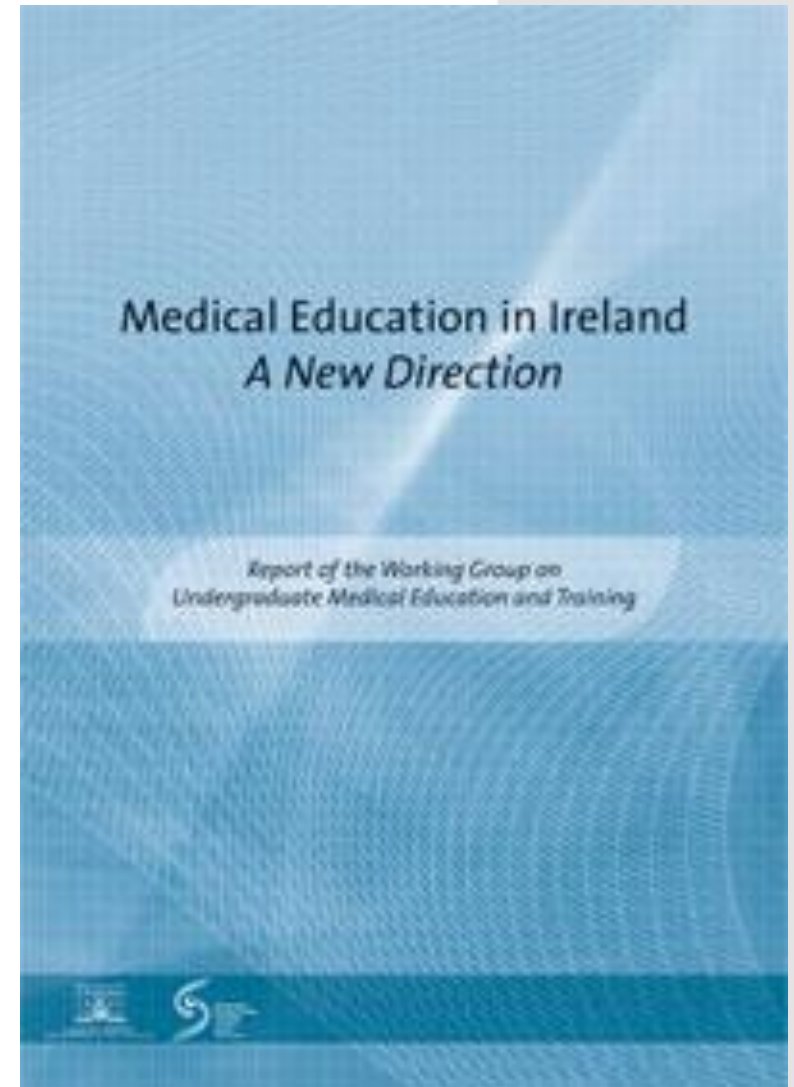


Using a Flipped Classroom to Improve Ophthalmology Practical Skills in Medical Students

Robert McGrath, Cork University Hospital
Mark James, Medical Education Unit, UCC

Background

- **Fottrell Report 2006**
 - “Excessive reliance on passive, large-group teaching methods”
 - “More emphasis on intensive small group interaction, including problem-based and group learning”



Background

Flipped Classroom Model

Basic Knowledge

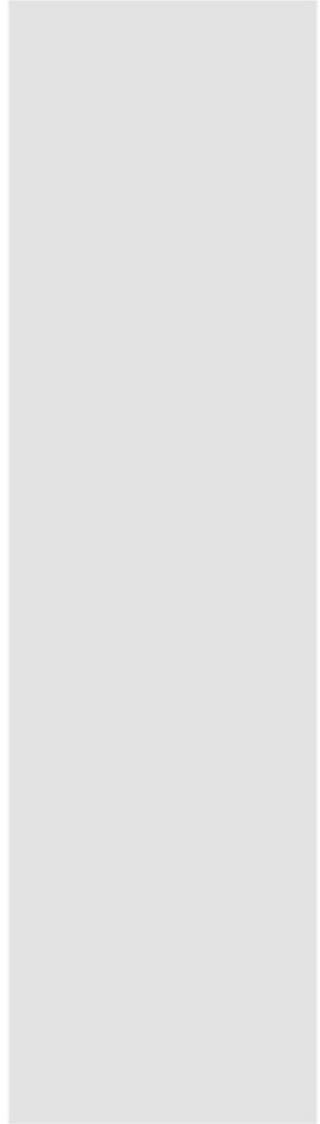


Expertise

Lectures



Home



Background

- Flipped Classroom: Benefits
 - Learn basic knowledge at own pace
 - Better use of time in lectures
 - Lecturer can intervene to help with difficult material
 - Better individual interaction
 - Increased student participation
 - Active learning

Previous Research: Allied Health Professions

- Nursing [Missildine 2013]
 - Significant improvement in grades, 57 more students achieved pass mark
- Pharmacy [Pierce 2012], [McLaughlin 2013]
 - Statistically significant improvement in student grades: 77% -> 81% average
 - Strong student preference for Flipped Classroom (89.5%)
- Physiology [Tune 2013]
 - Significant improvement in student performance: 68% -> 80% average
- Public health [Galway 2014]
 - Non-significant improvement in student grades
 - Significant increase in rating of Flipped course compared to traditional course:
4.0/5 -> 4.7/5

Previous Research: Medicine

- Geriatrics [Duque 2013]
- Emergency medicine [Lew 2016]
- Obstetrics & Gynaecology [Morgan 2014], [Gillespie 2016]
- Radiology Clerkships [Belfi 2015], [O'Connor 2016]
- Haematology [Sajid 2016]
- Surgery Clerkships [Liebert 2016]
- ACLS [Boysen-Orbson 2016]
- Evidence based medicine [Illic 2013], [Illic 2015]
- Overall
 - Mixed reports of increased student performance
 - Students very much in favour of Flipped Classroom model [Ramnanan 2017]

Aims and Objectives

- Apply a flipped classroom model to appropriate ophthalmology tutorials
- Prepare adequate pre-class learning material
- Prepare adequate in-class activities
- Measure student performance and satisfaction with the model

Methods: Research Subjects

- UCC Medicine Class of 2016
- Groups of 8-9
- Academic year 2014-2015

Methods: Choosing a Class to Flip

- Visual Fields
- Fundoscopy
- Readily available YouTube videos
- Important practical skills
- Alternating weeks



Methods: Pre-Class Material

- Fundoscopy/Visual Fields Examination
- Fundoscopy/Visual Fields Pathologies

Fundoscopy Background Knowledge Probe

1. Explain what the red-free filter on the ophthalmoscope is useful for.
2. List 3 causes of a poor red reflex.
3. What is the typical sign on fundoscopy associated with glaucoma?
4. Describe the key features on fundoscopy which would indicate the presence of a central retinal vein occlusion?
5. What are drusen at the macula usually representative of?

Visual Fields Background Knowledge Probe

1. Explain what the term 'blind spot' refers to in terms of the eye's visual fields.
2. What is the classic visual field defect associated with glaucoma?
3. List 3 causes of an altitudinal visual field defect.
4. What type of field defect does a pituitary tumour cause?
5. What part of the visual pathway is associated with a macular sparing left homonymous hemianopia?

Methods: In-Class Activities

- Review Background Knowledge Probes
 - Identify weaknesses
- Interactive Case Reports
 - Pathologies
- Practical Demonstration
 - Fundoscopy on models / each other
 - Visual Fields in pairs

Methods: Assessment

- Questionnaire
 - Self-perceived knowledge / confidence
 - Lecture ratings
 - Presentation
 - Clarity
 - Content
 - Interactivity
 - Opinions – flipped classroom
- Qualitative Feedback

Methods: Analysis

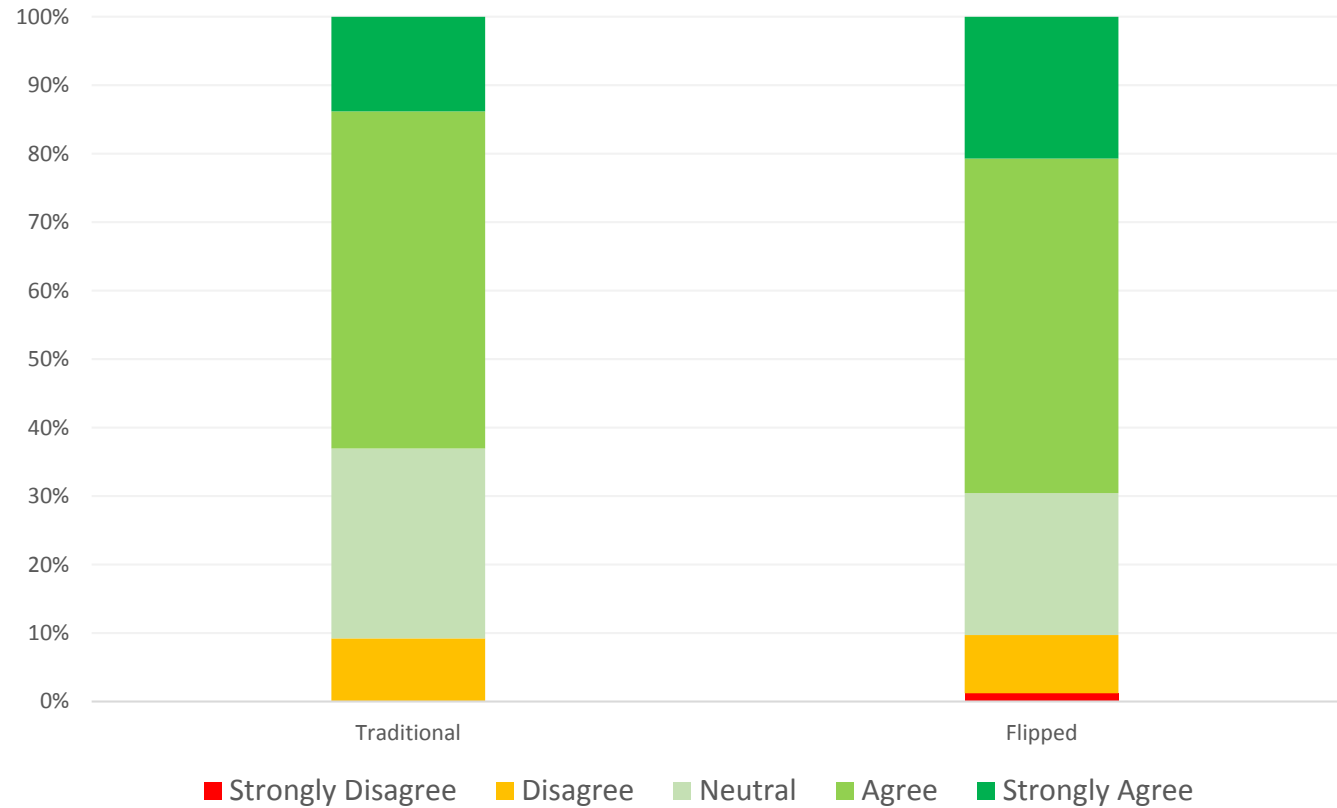
- SPSS v22
- Statistical significance
 - Mann-Whitney U Test ($p < 0.05$)

Results

- 147 Questionnaires completed & returned
- 65 Flipped Visual Fields & Traditional Fundoscopy
- 82 Flipped Fundoscopy & Traditional Visual Fields

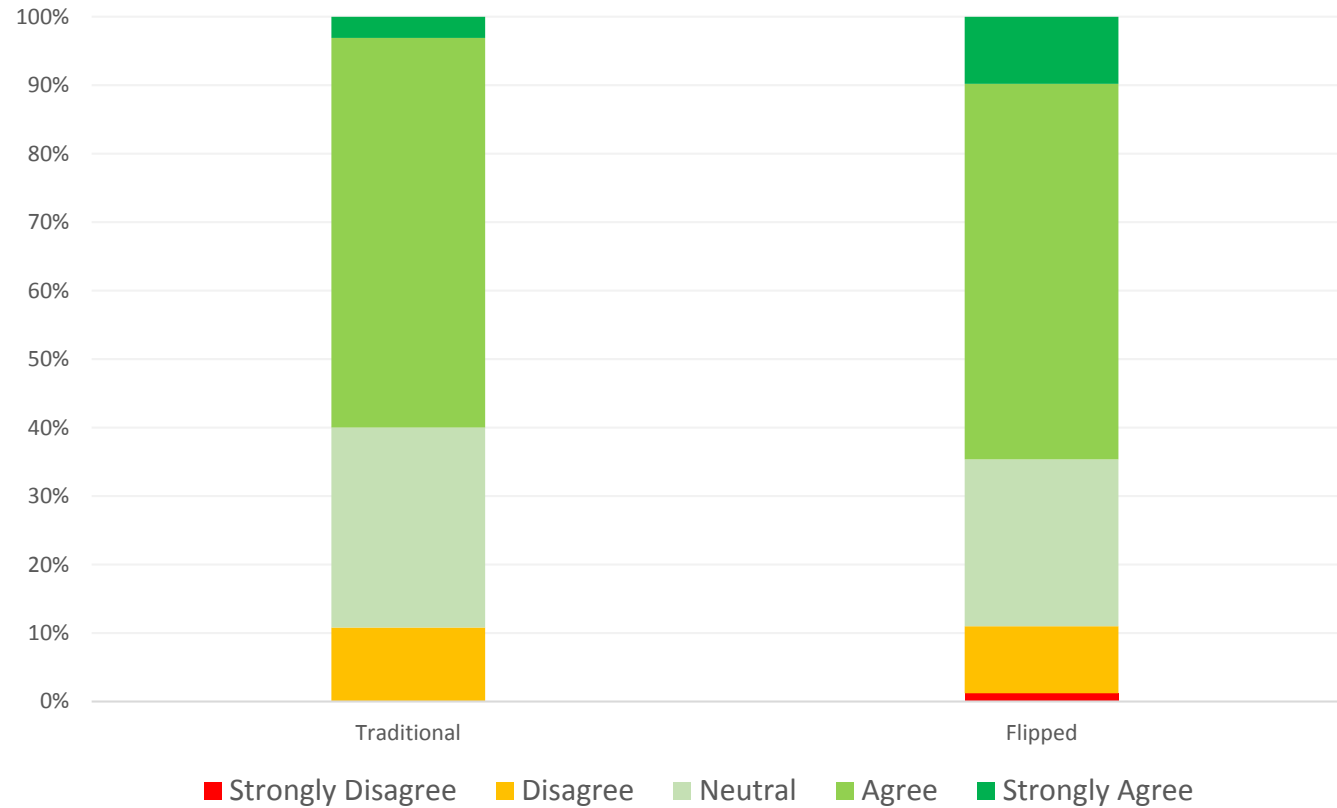
Results: Fundoscopy

	Traditional	Flipped	p-value
I am confident in my ability to accurately perform fundoscopy on a patient	3.68 ± 0.83	3.79 ± 0.91	0.35

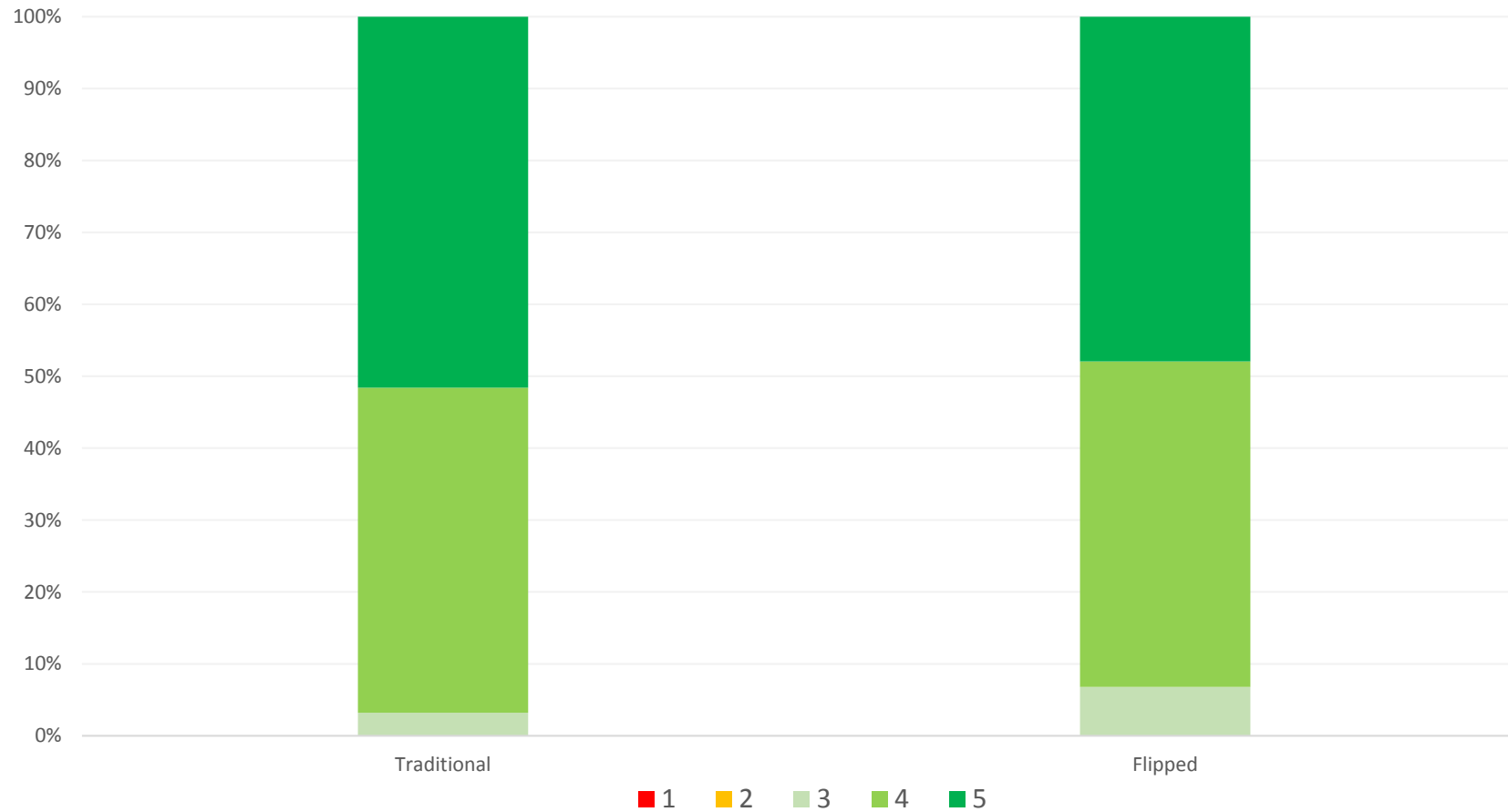


Results: Fundoscopy

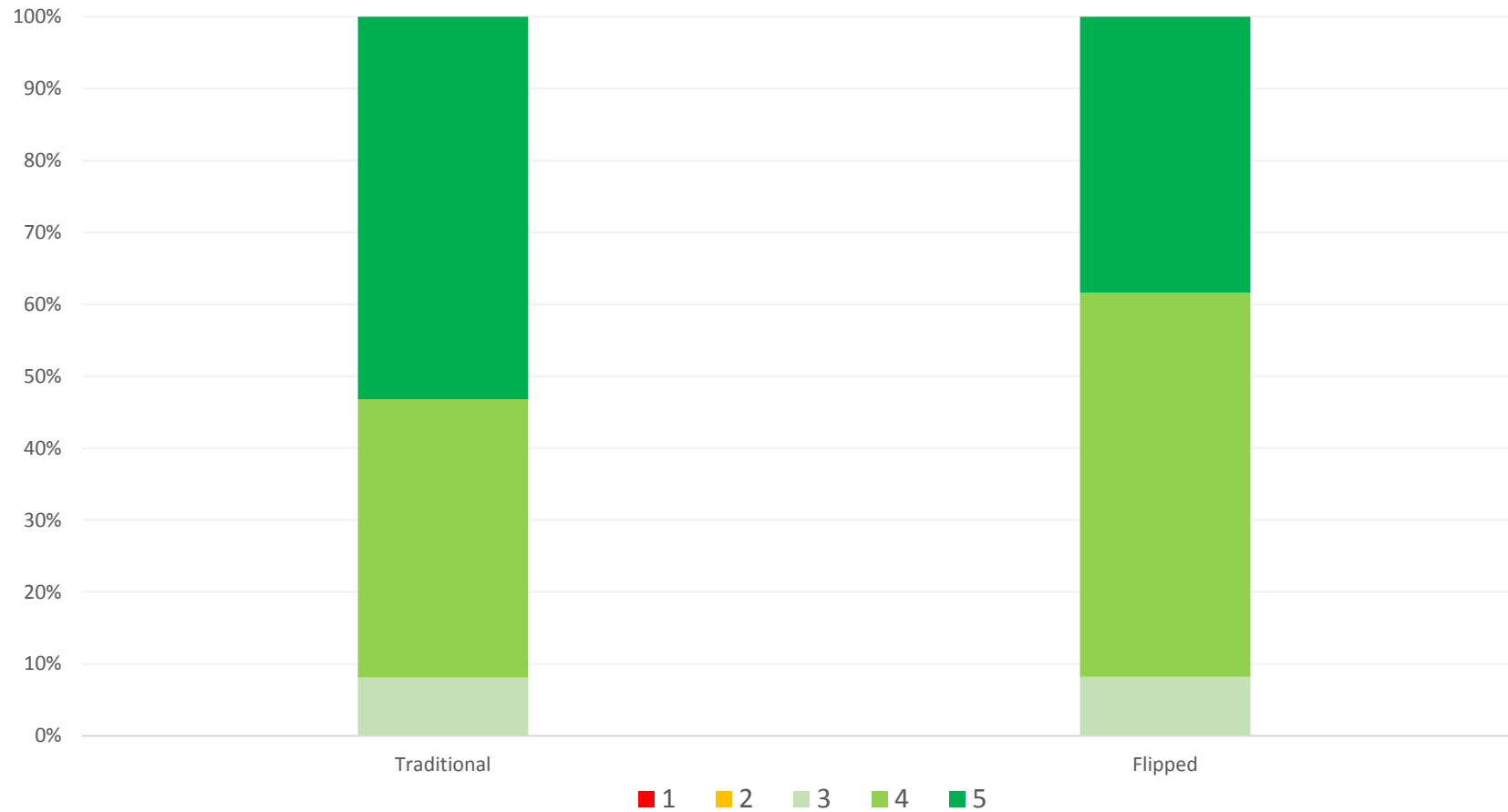
	Traditional	Flipped	p-value
I am confident in my ability to identify underlying pathologies leading to an abnormal result on fundoscopy examination	3.52 ± 0.73	3.62 ± 0.84	0.42



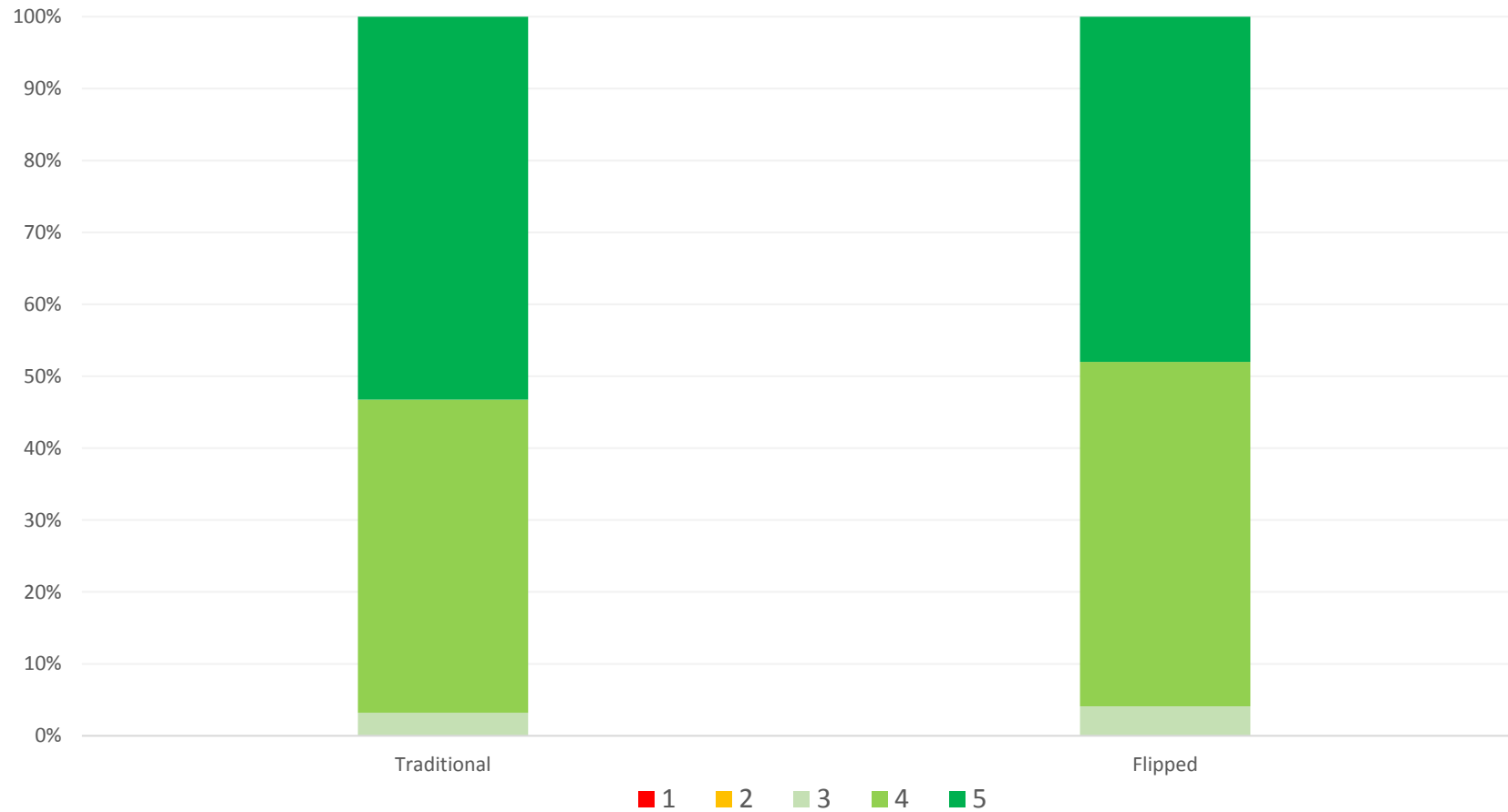
Results: Fundoscopy Presentation



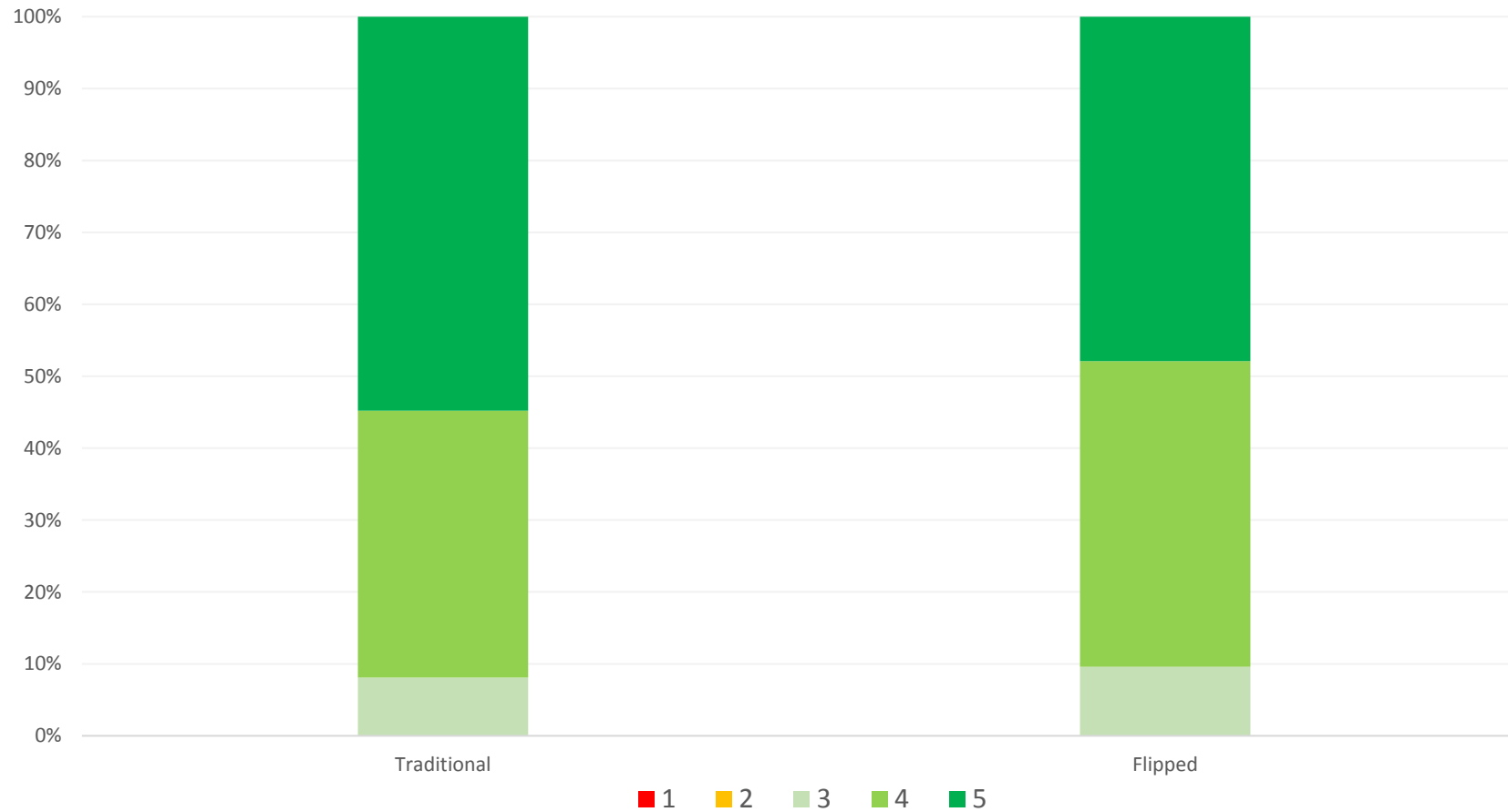
Results: Fundoscopy Clarity



Results: Fundoscopy Content

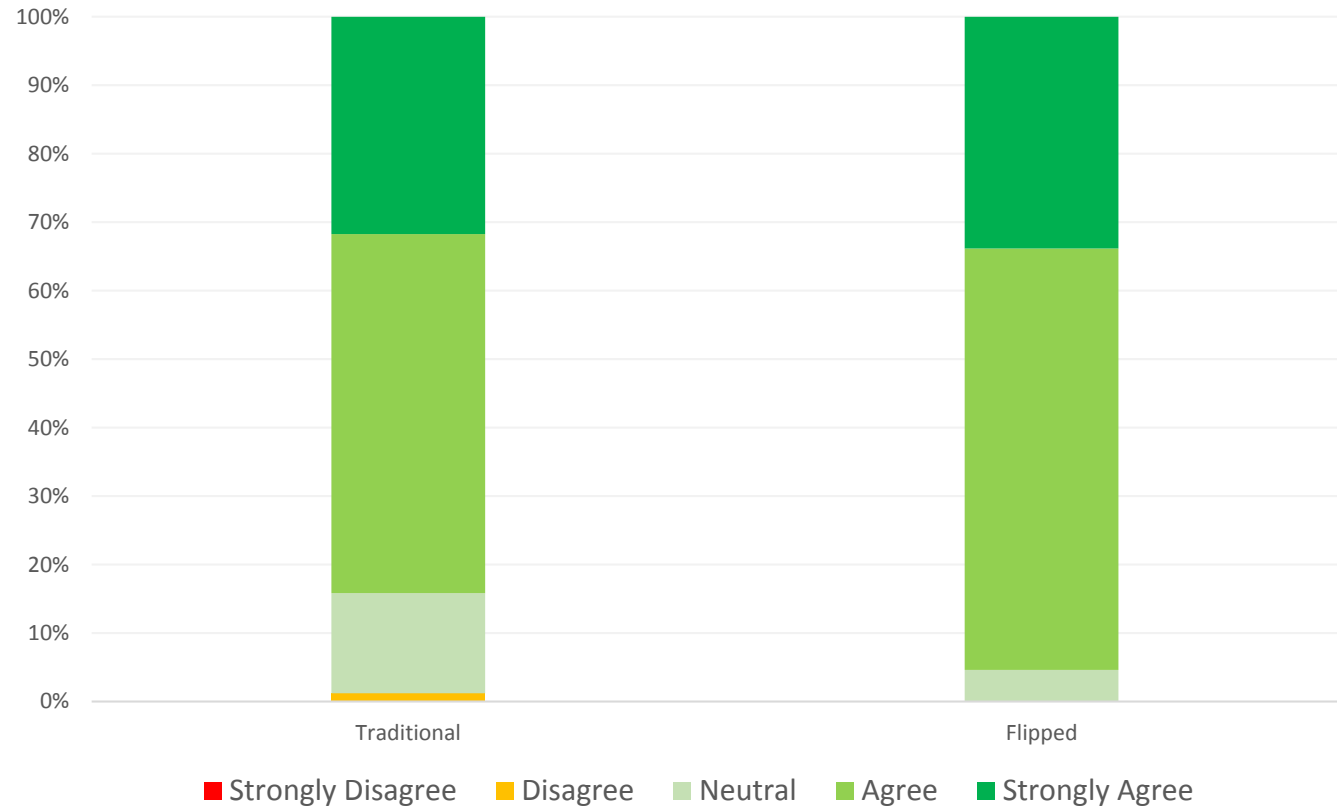


Results: Fundoscopy Interactivity



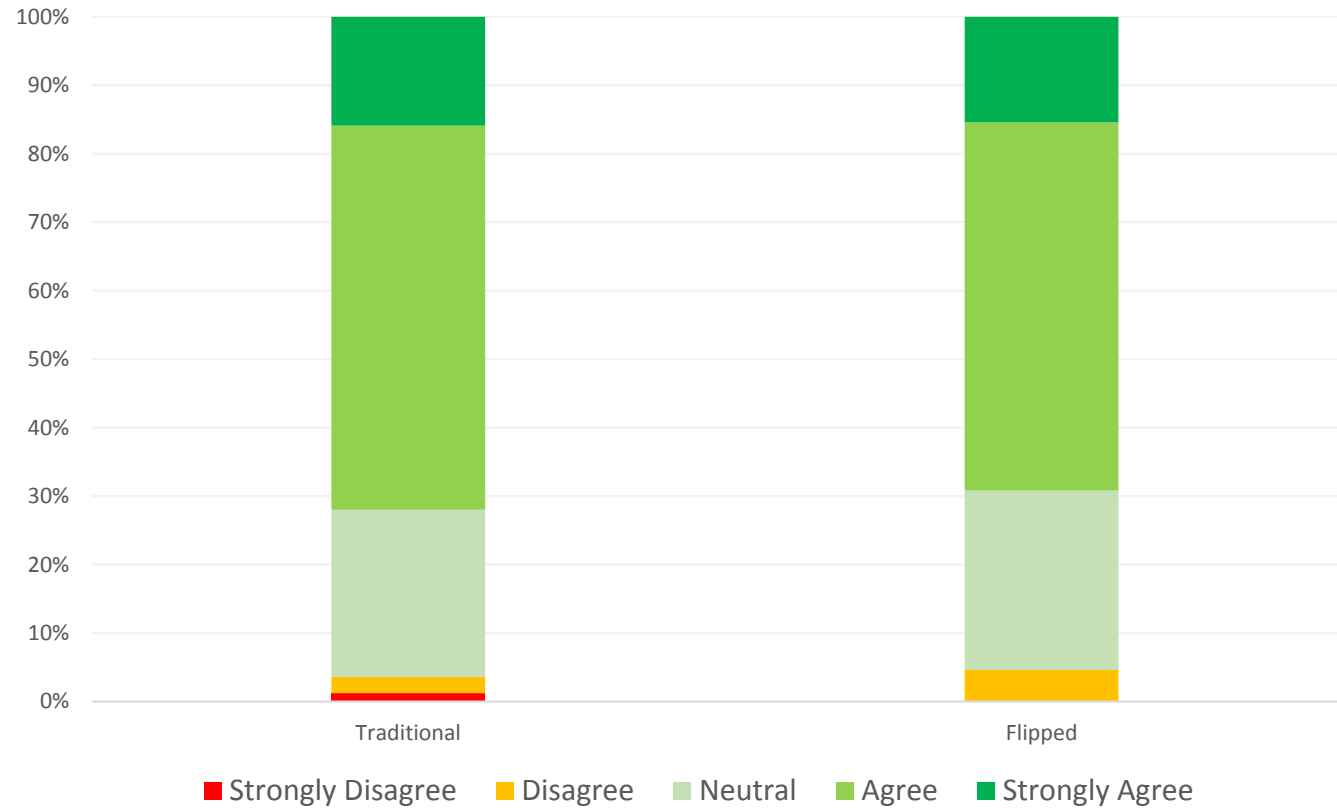
Results: Visual Fields

	Traditional	Flipped	p-value
I am confident in my ability to perform a visual fields examination on a patient	4.15 ± 0.7	4.29 ± 0.55	0.32

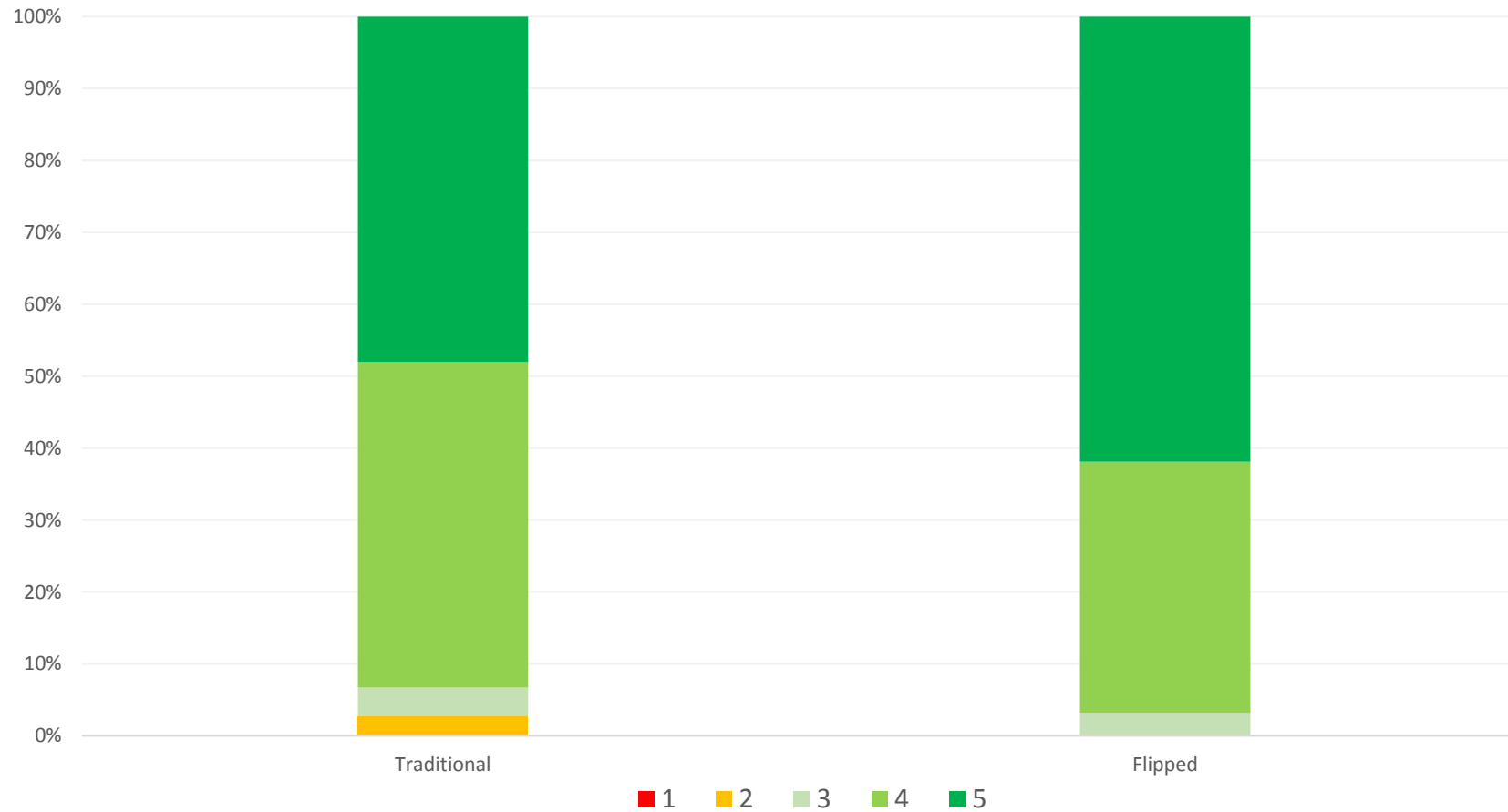


Results: Visual Fields

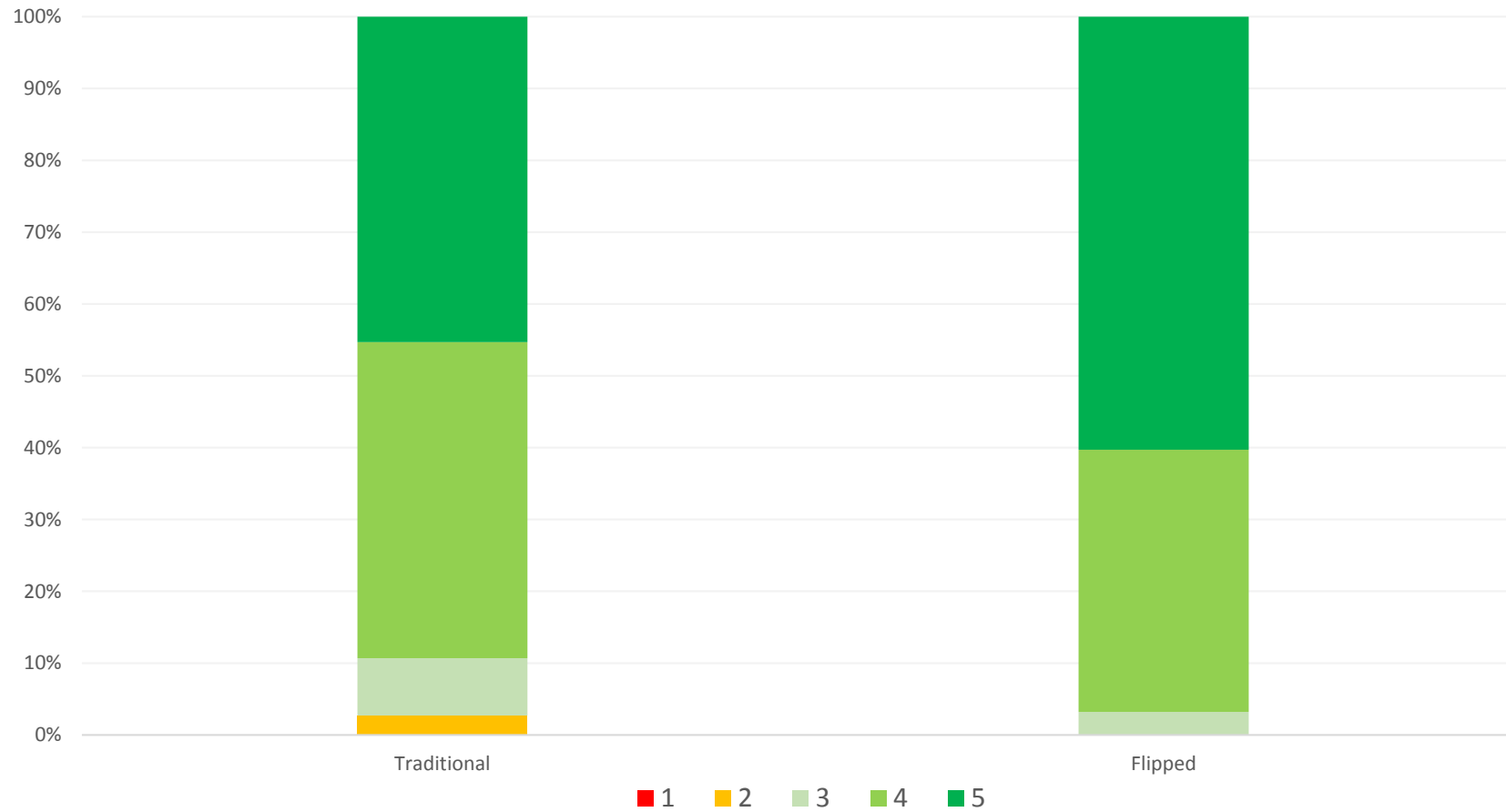
	Traditional	Flipped	p-value
I am confident in my ability to identify underlying pathologies leading to an abnormal result on visual fields examination	3.83 ± 0.77	3.8 ± 0.75	0.77



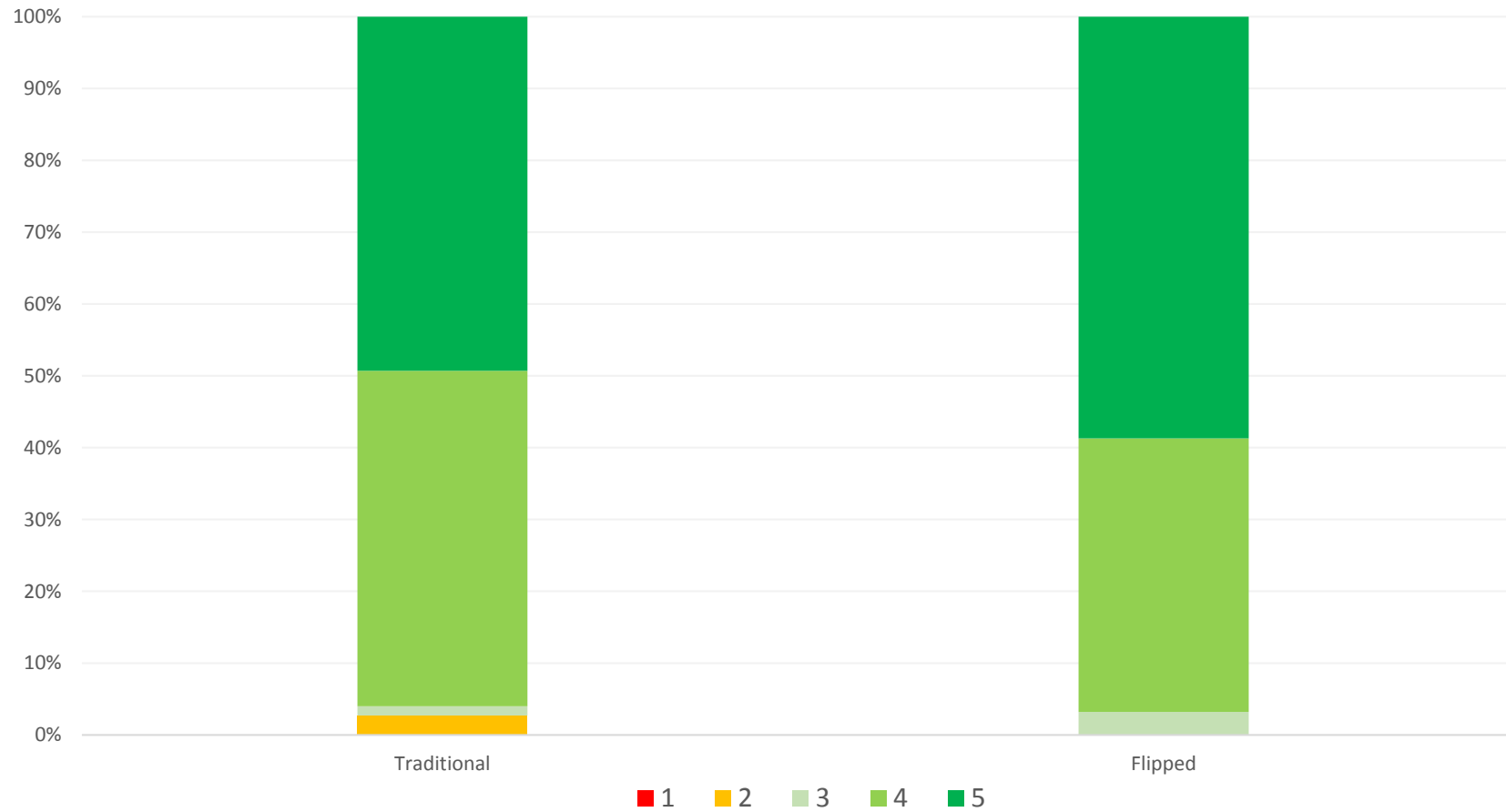
Results: Visual Fields Presentation



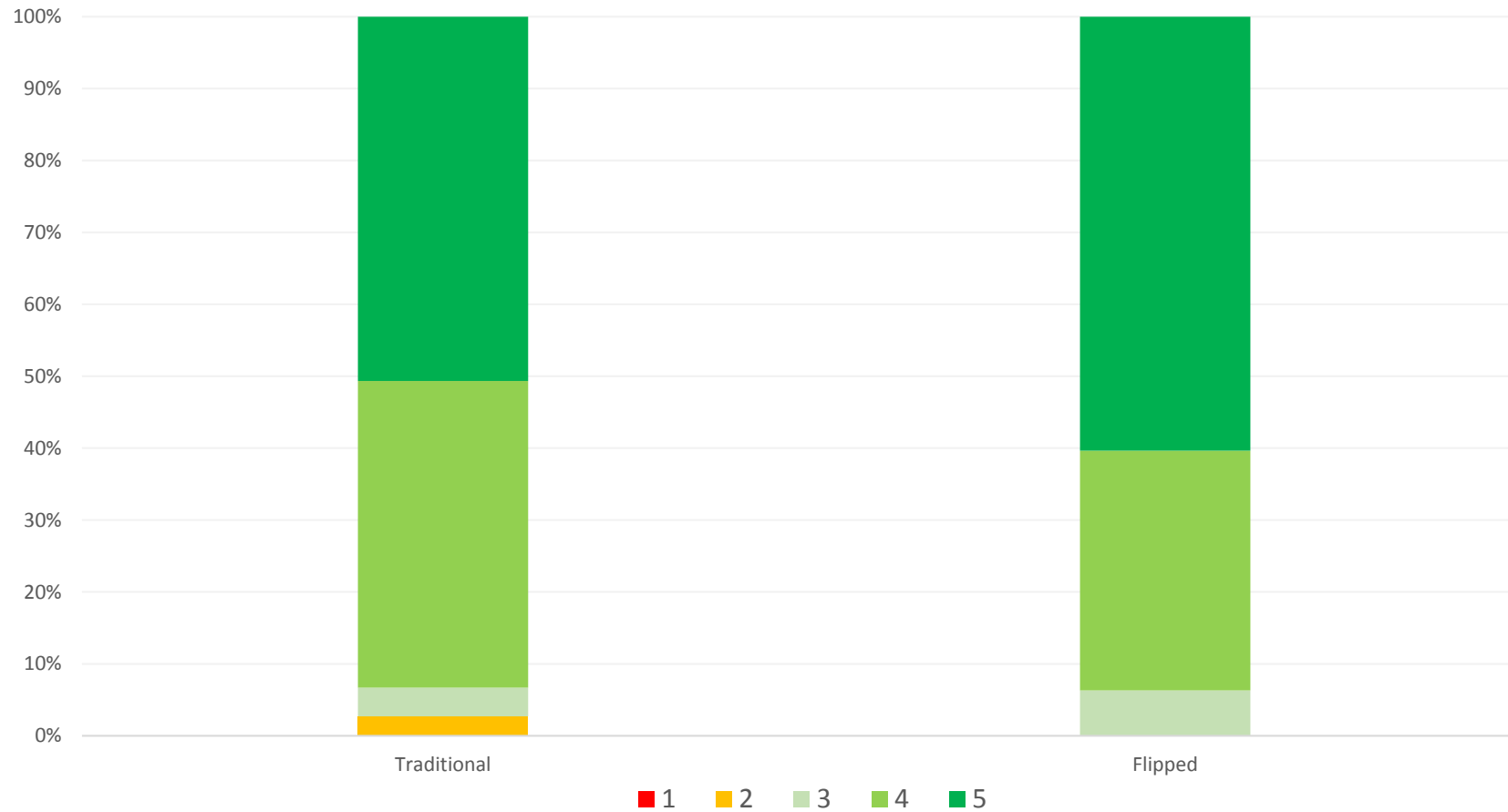
Results: Visual Fields Clarity



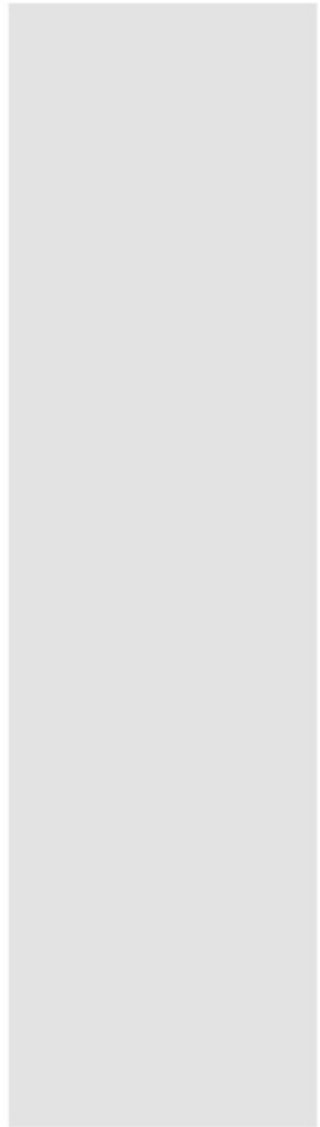
Results: Visual Fields Content



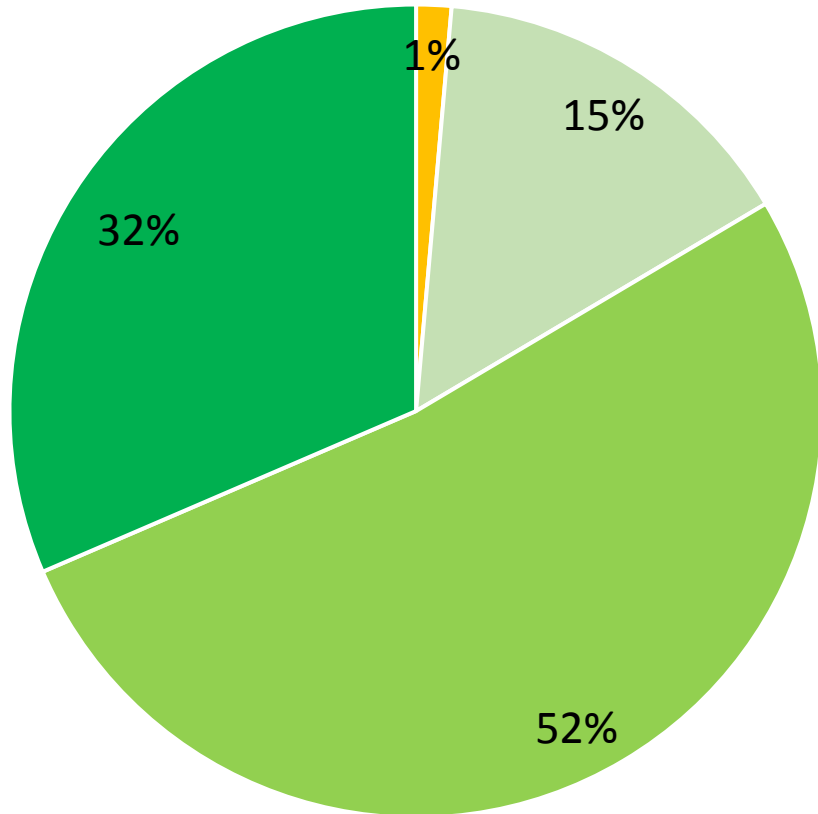
Results: Visual Fields Interactivity



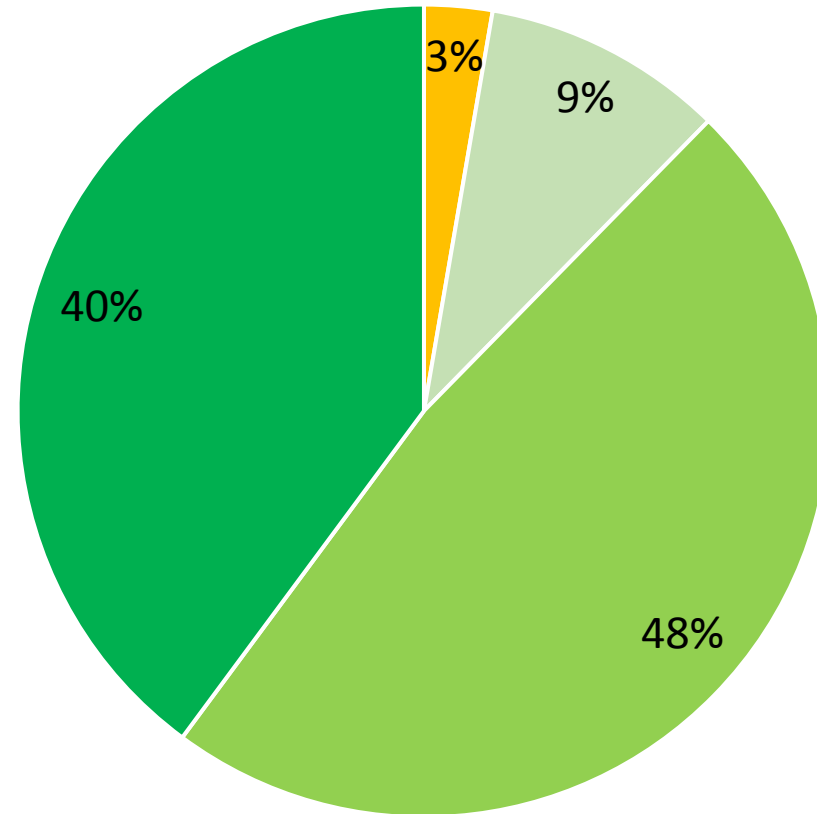
Results: Pre-Class Material Opinions



The online learning materials contributed to my learning



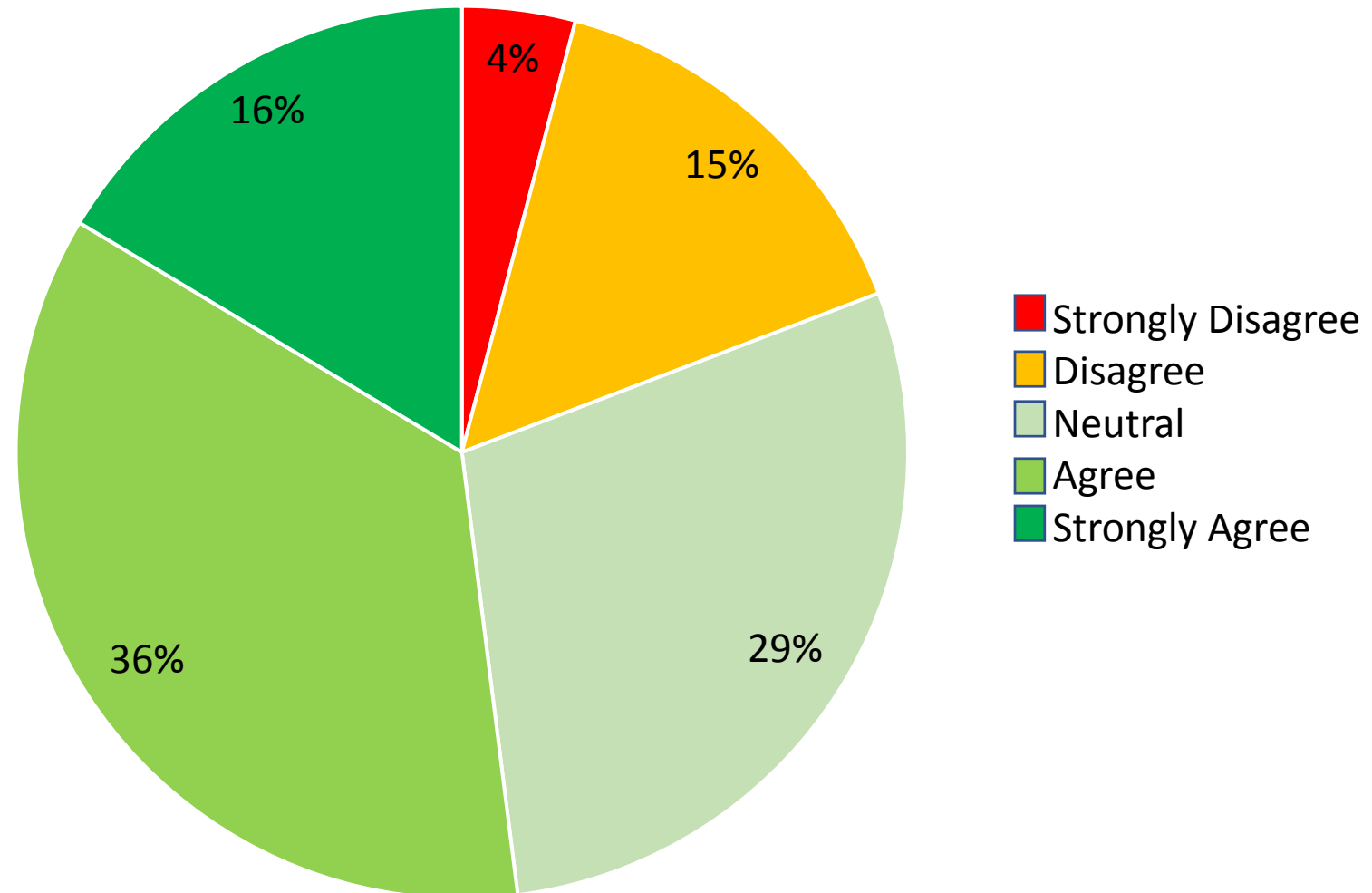
I enjoyed being able to view the lecture prior to scheduled class as opposed to live class lecture



- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

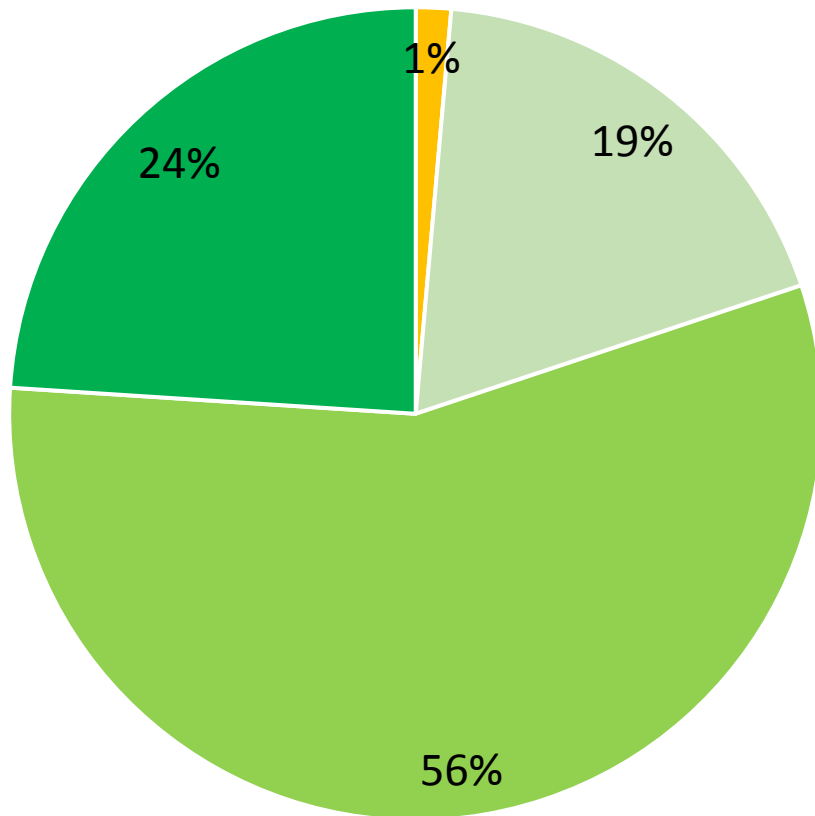
Results: Pre-Class Material Opinions

There was sufficient time to complete all pre-class material

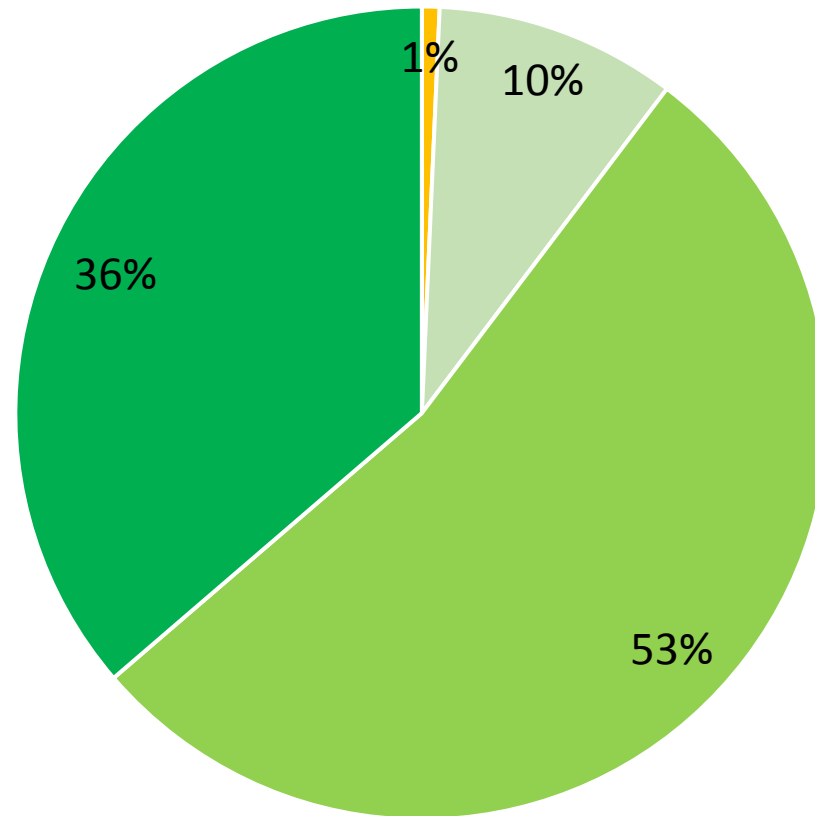


Results: In-Class Material Opinions

The flipped classroom model helped to grasp concepts



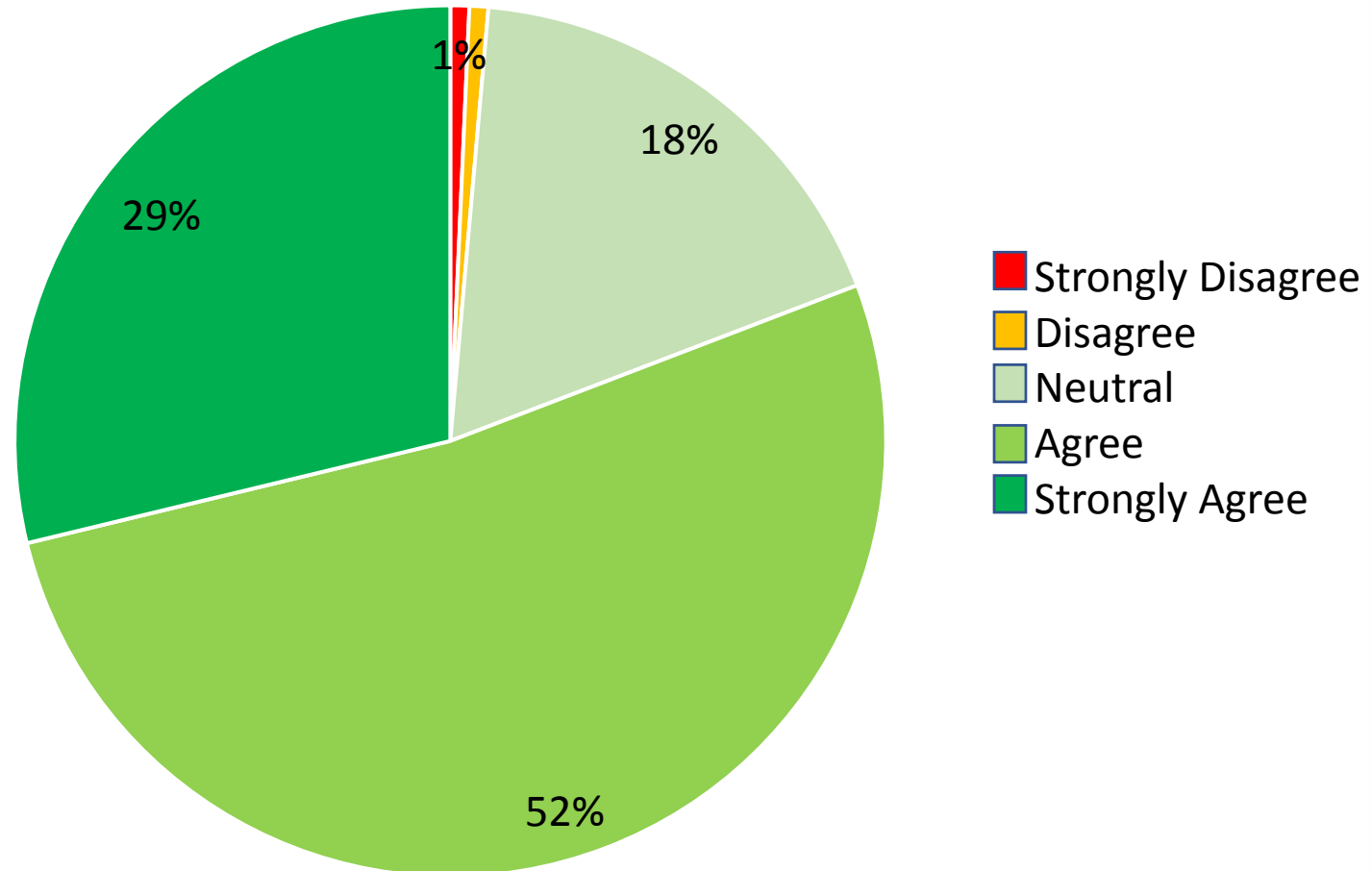
Interactive, applied in-class activities greatly enhanced my learning



- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

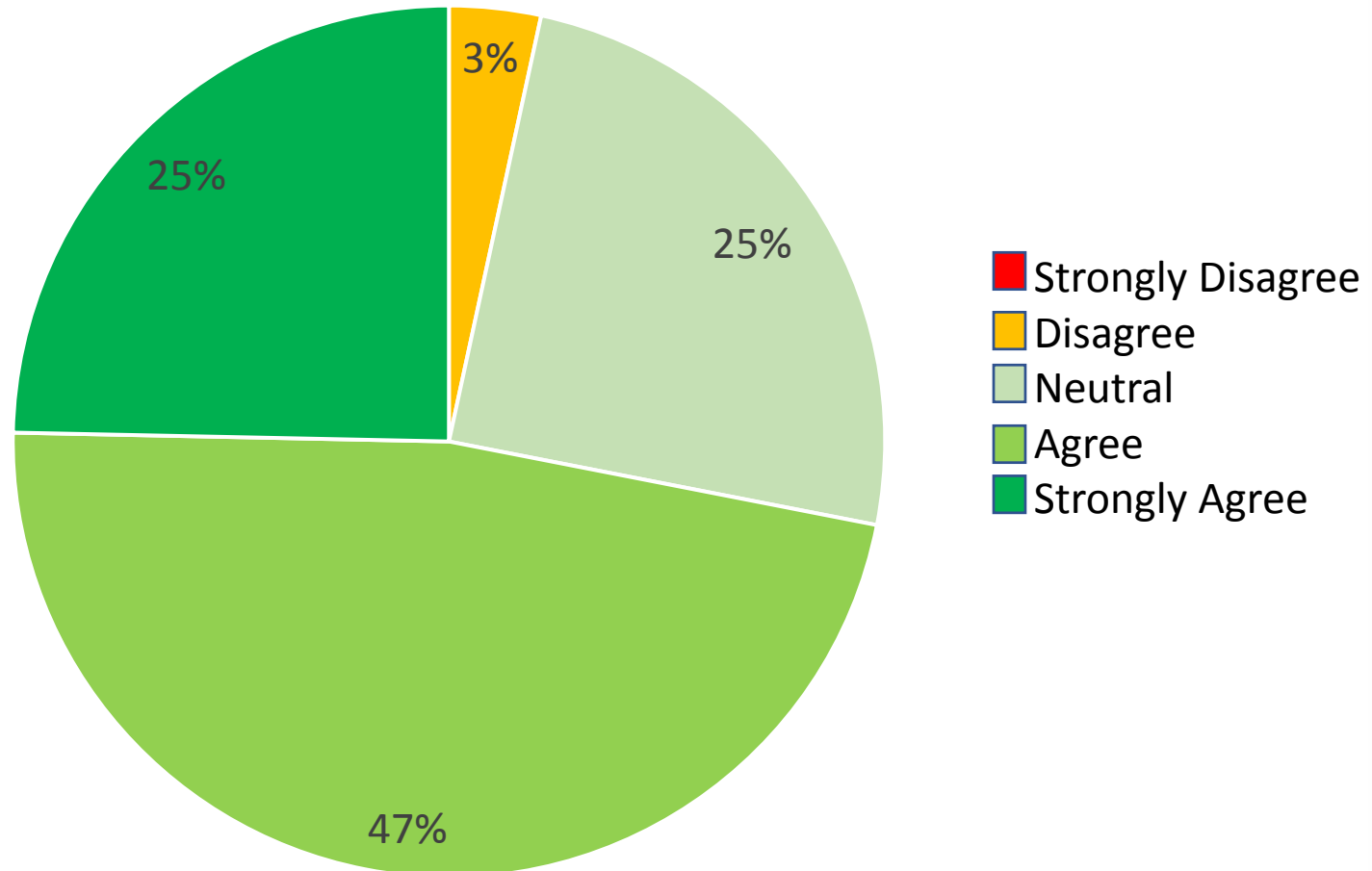
Results: In-Class Material Opinions

The flipped classroom model enabled more interaction with my instructor and classmates



Results: Opinions

In the future, I would rather take a 'flipped' course than a traditional course



Results: Qualitative Feedback

- Pre-class material
 - “improved information retention”
 - “facilitated better self-directed learning”
- In-class material
 - “good change to normal lectures”
 - “if every module was taught like this we would all be far better clinically”

Discussion: Limitations

- Limited Scope
 - 2 tutorials flipped
- Anonymity
 - No demographic data
- Exam data not used
 - No objective measure of student performance

Discussion: Conclusions

- No statistically significant differences in self-perceived learning
- 72% of students in favour of flipped classroom in future

References

- Fottrell P, Bury G, Buttimer J, Carney A, Collins T, Cunningham A. Medical Education in Ireland: A New Direction. Department of Health and Children. 2006.
- Missildine K, Fountain R, Summers L, Gosselin K. Flipping the classroom to improve student performance and satisfaction. *The Journal of nursing education*. 2013;52(10):597-9.
- Pierce R, Fox J. Vodcasts and active-learning exercises in a "flipped classroom" model of a renal pharmacotherapy module. *American journal of pharmaceutical education*. 2012;76(10):196.
- Tune JD, Sturek M, Basile DP. Flipped classroom model improves graduate student performance in cardiovascular, respiratory, and renal physiology. *Advances in physiology education*. 2013;37(4):316-20.
- McLaughlin JE, Griffin LM, Esserman DA, Davidson CA, Glatt DM, Roth MT, et al. Pharmacy student engagement, performance, and perception in a flipped satellite classroom. *American journal of pharmaceutical education*. 2013;77(9):196.
- Galway LP, Corbett KK, Takaro TK, Tairyan K, Frank E. A novel integration of online and flipped classroom instructional models in public health higher education. *BMC medical education*. 2014;14(1):181.
- Duque G, Demontiero O, Whereat S, et al. Evaluation of a blended learning model in geriatric medicine: a successful learning experience for medical students. *Australas J Ageing*. 2013;32(2):103–109.
- Lew, E. K. (2016). "Creating a contemporary clerkship curriculum: the flipped classroom model in emergency medicine." *Int J Emerg Med* 9(1): 25.
- Morgan, H., et al. (2015). "The flipped classroom for medical students." *Clin Teach* 12(3): 155-160.
- Gillispie, V. (2016). "Using the Flipped Classroom to Bridge the Gap to Generation Y." *Ochsner J* 16(1): 32-36.
- Belfi, L. M., et al. (2015). ""Flipping" the introductory clerkship in radiology: impact on medical student performance and perceptions." *Acad Radiol* 22(6): 794-801.
- O'Connor, E. E., et al. (2016). "Flipping Radiology Education Right Side Up." *Acad Radiol* 23(7): 810-822.
- Sajid, M. R., et al. (2016). "Can blended learning and the flipped classroom improve student learning and satisfaction in Saudi Arabia?" *Int J Med Educ* 7: 281-285.
- Liebert, C. A., et al. (2016). "Effectiveness of the Surgery Core Clerkship Flipped Classroom: a prospective cohort trial." *Am J Surg* 211(2): 451-457.e451.
- Boysen-Osborn, M. and C. L. Anderson (2016). "Flipping the Advanced Cardiac Life Support Classroom with Team-based Learning: Comparison of Cognitive Testing Performance for Medical Students at the University of California, Irvine, United States." **13: 11.**
- Ilic, D., et al. (2013). "Adopting a blended learning approach to teaching evidence based medicine: a mixed methods study." *BMC Med Educ* 13: 169.
- Ilic, D., et al. (2015). "A randomised controlled trial of a blended learning education intervention for teaching evidence-based medicine." *BMC Med Educ* 15: 39.
- Ramnanan, C. J. and L. D. Pound (2017). "Advances in medical education and practice: student perceptions of the flipped classroom." *Adv Med Educ Pract* 8: 63-73.