

# Categorizing Exam Questions to Guide Student Learning

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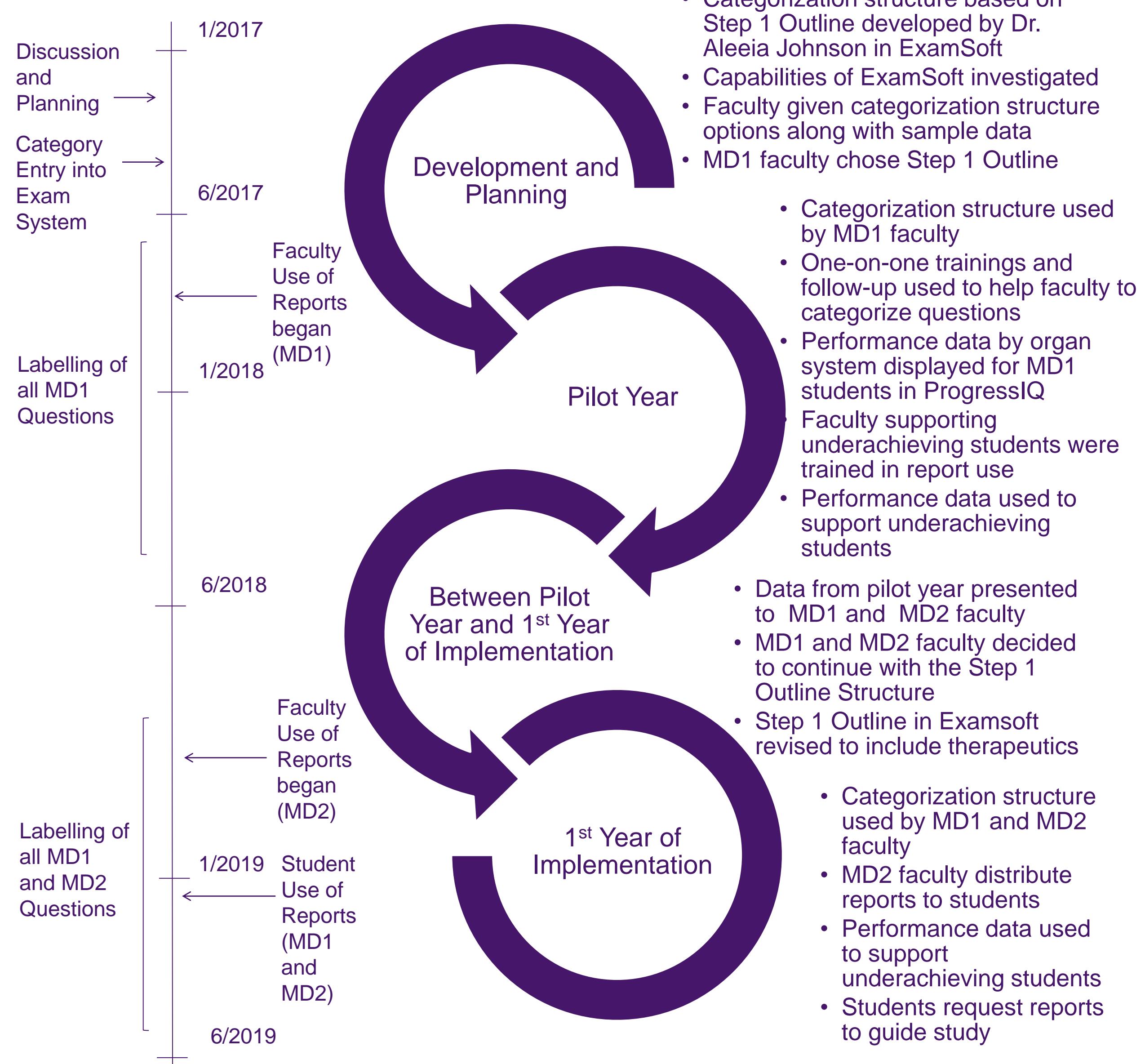

## Introduction

A structure for adding category assignments to exam questions was developed and adopted. These category assignments are used across the medical school curriculum and are linked to course learning outcomes. The category assignments are added to exam questions within the exam delivery platform ExamSoft (©ExamSoft Worldwide). Question performance by category can be assessed through Examsoft and displayed in an educational tracking and reporting program called ProgressIQ (© Academic Progress Intelligence).

The purpose for this category assignment structure was threefold:

1. To provide students, faculty, and advisors with data regarding student's strengths and weaknesses by learning outcome
2. To provide prescriptive interventions to students based on learning outcomes strengths and weaknesses.
3. To provide learning outcomes data that are key to driving improvement of the curriculum and instructional practices

## Development and Implementation Process



## Initial Outcomes

### Category Structure

18 Primary Categories	65 Secondary Categories	645 Tertiary Categories
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Example of Primary, Secondary, and Tertiary Categories for Category VII. Musculoskeletal System

- VII. Musculoskeletal System
  - VII.A. Normal processes
    - VII.A.1. Embryonic development, fetal maturation, and perinatal changes (including limb development)
    - VII.A.2. Muscle and bone structure and function
    - VII.A.3.a. Cell and tissue structure and function: biology of bones, joints, tendons, skeletal muscle, cartilage
    - VII.A.3.b. Exercise and physical conditioning/deconditioning
    - VII.A.4. Repair, regeneration, and changes associated with stage of life
  - VII.B. Abnormal processes
    - VII.B.1.a. Infectious disorders
    - VII.B.1.b. Immunologic disorders
    - VII.B.1.c. Inflammatory disorders
    - VII.B.2.a. Benign neoplasms
    - VII.B.2.b. Malignant neoplasms of bone, muscle, and soft tissue
    - VII.B.2.c. Metastases to bone
    - VII.B.2.d. Secondary malignant neoplasms of bone
    - VII.B.3.a. Degenerative/metabolic disorders of bone, tendon, and cartilage
    - VII.B.3.b. Degenerative/metabolic disorders of joints
    - VII.B.4. Traumatic and mechanical disorders
    - VII.B.5. Congenital disorders
    - VII.B.6. Adverse effects of drugs on the musculoskeletal system
  - VII.C. Principles of Therapeutics

### Rationale for Structure:

- 1) Outline structure links back to USMLE test outline
- 2) Integrates content (normal, abnormal, and therapeutics) across 1<sup>st</sup> and 2<sup>nd</sup> year by organ system
- 3) Provides details and big picture
- 4) Fits with capabilities and limitations of ExamSoft
- 5) Complements categories already in place
- 6) Provides information to help students prepare for Step 1

### Category Use

- 4567 test questions categorized using the Step 1 Content Outline.
- Course Directors categorizing questions for 4 out of 6 MD1 Courses and 5 out of 6 MD2 Courses.
- 87% of MD1 and MD2 multiple choice exam questions categorized in 2018-2019.
- Student performance reports by categories generated for 21 underachieving MD1 students 11 different times throughout the 2017-2018 academic year and for 5 underachieving MD1 students 8 different times throughout the academic year in the 2018-2019 academic year.
- MD2 faculty have distributed category performance reports to students after exams in the 2018-2019 academic year.
- Faculty supporting underachieving students have requested category reports for at least 19 students in 2018-2019.
- 4 students have requested and received summative reports by category in the 2018-2019 academic year.

## Examples of Student Performance Reports for Student and Faculty Use

Topics: Step 1 Outline (LOC18) Academic Year: 2018-2019			
Item	Score	Average	Possible
I. General Principles of Foundational Science	86.39%	86.90%	191
II. Immune System	80%	87.10%	10
III. Blood & Lymphoreticular System	75.56%	83.65%	45
IV. Nervous System	83.72%	80.02%	86
VI. Skin & Subcutaneous Tissue	44.44%	80.72%	9
VII. Musculoskeletal System	75.25%	79.68%	101
VIII. Cardiovascular System	78.41%	85.36%	88
IX. Respiratory System	89.29%	77.92%	56
X. Gastrointestinal System	78.21%	79.15%	78
XI. Renal & Urinary System	89.55%	81.70%	67
XII. Pregnancy, Childbirth, & the Puerperium	100%	94.00%	1
XIII. Female Reproductive System & Breast	94.29%	85.66%	35
XIV. Male Reproductive System	91.30%	91.36%	23
XV. Endocrine System	89.39%	85.08%	66
XVI. Multisystem Processes & Disorders	92.16%	88.97%	51
XVII. Biostatistics, Epidemiology/Population ...	83.33%	83.83%	6
XVIII. Social Sciences	100%	96.33%	3

# Items	Group Average	Sample Student
V. Nervous System	32	81.57%
V. Nervous System/V.C. Principles of Therapeutics	28	83.93%
V. Nervous System/V.C. Principles of Therapeutics/V.C.12 Drugs affecting autonomic nervous system including all general autonomic pharmacology	28	81.09%
VIII. Cardiovascular System	160	76.15%
VIII. Cardiovascular System/V.II.B. Abnormal Processes	135	76.71%
VIII. Cardiovascular System/V.II.B. Abnormal Processes/V.II.B.05. Ischemic heart disease	17	81.21%
VIII. Cardiovascular System/V.II.B. Abnormal Processes/V.II.B.06. Diseases of the myocardium	16	75.61%
VIII. Cardiovascular System/V.II.B. Abnormal Processes/V.II.B.14. Congenital disorders, including disease in adults	17	80.72%
VIII. Cardiovascular System/V.II.C. Principles of Therapeutics	21	75.35%
VIII. Cardiovascular System/V.II.C. Principles of Therapeutics/V.II.C.01 Coronary and peripheral vasodilators	18	84.56%
VIII. Cardiovascular System/V.II.C. Principles of Therapeutics/V.II.C.02 Antiarrhythmic Drugs	19	77.37%
VIII. Cardiovascular System/V.II.C. Principles of Therapeutics/V.II.C.03 Antihypertensive Drugs	37	83.02%
VIII. Cardiovascular System/V.II.C. Principles of Therapeutics/V.II.C.07 Inotropic agents and treatment of heart failure	19	81.83%

## Future Plans

- To make cumulative reports at primary and tertiary levels available to students after every exam block in ProgressIQ or another educational platform.
- To provide additional resources to students that are linked to the USMLE-based exam question content outline.

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