

HumMed: Making the Invisible Visible by Measuring Humanism in Medical Students

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I. Education Aims. The ability to connect with patients seeking care is one of the most daunting aspects of learning to be a physician. This essential skill, combining both compassion and empathy transforms a medical student into a humanistic physician and is the foundation of patient centered care. The HumMed project aims to identify key attributes that characterize the Humanistic Medical student that can be assessed, taught, and replicated in multiple educational settings. HumMed will help faculty to better assess, give feedback to, coach and remediate medical students as they strive to become effective clinicians. We propose to re-imagine and advance the teaching and learning of medical students, as well as other healthcare professionals, by exploring: How can empathic behaviors be accurately detected, quantified, and measured in communicative events to provide precise, yet comprehensive formative feedback that can be used by students to improve interactions with patients and by faculty for detection and remediation of poor communication skills? We plan to apply and test novel methods focused on voice analysis of emotion and video protocol analysis developed by the PBL Lab to identify engaging behaviors in communicative events in order to create precision in teaching and feedback and direct it to the creation of a more humanistic medical student and physician. HumMed will be a critical first step in our interdisciplinary venture between the Stanford School of Medicine and the PBL Lab in the School of Engineering that will connect educational scholarship about humanism in healthcare with the engineering design principles of collaborative teamwork and big biometric and voice data analytics. Our project aligns well with Stanford's vision of personalized, precision medicine by focusing on personalizing and creating precision in teaching and feedback for our medical students and physicians in training.

II. Project Rationale. The current state-of-practice is that trained and experienced standardized patients (SP) are the assessors evaluating the medical students' performance with regard to the ability to make a connection and the qualitative perceived degree of empathy expressed. A structured survey using a 1-10 evaluation scale (1= low, 10=high) is used. Medical education literature is equivocal about whether this method accurately reflects empathy and communication skills (Perella 2016). It remains unclear if simulations utilizing SPs simply elicit a performance and a rudimentary level of empathy, thereby perpetuating a minimum standard of empathy in actual practice (Wear and Varley, 2008).

HumMed proposes to use innovative analytics applied to novel interaction data such as voice, body motion, and posture which allows for quantitative feedback focused on the degree of empathic behavior and connectedness. Voice, body motion, and posture are empathic behaviors that can be taught and learned, not just by medical students but also by all healthcare practitioners that interact with patients. The ultimate HumMed goal is to improve medical education and training by augmenting the individual empathic and emotional intelligence of the medical student and other healthcare professionals.

The HumMed project is at the intersection of emotional intelligence research, affective computing, and education research focused on engagement and empathic behavior. Learning engagement in education is a highly researched topic aiming to better understand when and how students engage in learning processes and maintain a state of high focus under complex demands (Education glossary, Craig & Silverstone, 2010; Schaufeli et al., 2006; Tattershall & Hockey, 2010; Fletcher, 2005). The PBL Lab research team has developed analytics and markers to characterize engagement in global project teams and develop recommendations as to how education should be designed in order to better engage students (Fruchter, 2006; Fruchter 2014; Ma and Fruchter, 2015; Frank et al., 2015; Frank et al., 2016; Zhang and Fruchter, 2017). Pioneering work by Goleman teaches us that emotional engagement can often matter more than strictly cognitive factors (Goleman, 2006). Early foundational studies by Mehrabian et al. (1967) emphasize the relative importance of non-verbal and verbal communication. Their findings show a distribution of 7%-38%-55% for the respective relative impact of words, tone of voice, and body movement during communicative events. Education research has investigated optimal learning scenarios to increase engagement and detect affect (Kelly et al., 2015; D'mello et al., 2007; D'mello et al., 2015; Pardos et al., 2013). However, most methods assessing affective qualities of educational experiences offer only qualitative approaches. They do not provide objective opportunities for quantitative feedback. The affective computing analytics of biometric and physiological sensor data in HumMed will allow us to

gain valuable insights beyond what we can even realize today and make the learners' invisible emotional and behavioral state visible on a moment-by-moment basis. By testing and expanding such approaches to better understand the elements of the interaction dynamics between medical students and SPs we can explore methods to increase the learner's empathy. This will allow us to move beyond the limits imposed by surveys to collect and better analyze quantitative data on learner engagement and empathy.

III. Approach. HumMed proposes to test and validate the PBL Lab innovative analytic framework to detect and assess the humanistic tendencies of medical students in their interactions with SP. Dr. Fruchter together with Drs. Bhargava, Nevins, and Thomson Hall will review and select 10 representative recorded video encounters of medical students with SPs in the Li Ka Shing Center (LKSC) simulation center for this pilot testbed. We will formalize a discourse coding schema aligned with medical humanistic student assessment and expand the PBL Lab analytic framework. Dr. Fruchter's novel methods of voice and video analysis will be further expanded for HumMed to characterize the humanistic elements of this interaction. Based on more than two decades of studying global project team interactions, Dr. Fruchter will code and analyze the professionally transcribed Mini CPX recordings. She will: (i) integrate quantitative biometric body movement analysis and speech analysis focused on arousal, mood, valence and temper, with contextual video protocol analysis of recorded Mini CPX encounters of standardized patients and medical students during their training, and (ii) correlate the quantitative analysis results with the qualitative assessment of their performance from standardized patients. We will formalize preliminary HumMed empathic interaction attributes based on these analysis results.

IV. Timeline and plan for implementation. We plan to use a multi-method approach combining qualitative and quantitative analysis methods.

Autumn Quarter 2017

1. Review and select 10 recorded video encounters of medical students with SPs in the Li Ka Shing Center (LKSC) simulation center in collaboration with Drs. Bhargava, Nevins, and Thomson Hall.
2. Develop of HumMed framework: (i) Formalize discourse coding aligned with medical humanistic student assessment metrics. (ii) Expand the PBL Lab interaction analysis method to detect and assess the level of empathy and connection exhibited by medical students in Mini CPX sessions. (iii) Define empathic discourse analytics and indicators.
3. HumMed analysis of the first set of 5 mini CPX recordings – voice analysis and body motion video protocol analysis and coding of transcribed Mini CPX recordings.
4. Preliminary comparison of HumMed results with the scores given by SPs to the medical students.

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5. Revise HumMed analysis and validate analysis with the second set of 5 mini CPX recordings – voice analysis and body motion video protocol analysis and coding of transcribed Mini CPX recordings.
6. Compare and correlate the results generated by HumMed with SP scores given to medical students.
7. Define recommendations, future research, document, and disseminate, and seek further funding.

V. Anticipated work product. The HumMed will demonstrate novel practical analytics and indicators to better understand the emotional valence of medical students in Mini CPX sessions and provide new quantitative empathic indicators in addition to the current qualitative survey scores given by the SPs. These will offer insights that: (1) inform instructors who will be able to improve the training curriculum and (2) provide feedback to medical students to reflect and improve empathic interaction with patients.

VI. Evaluation plan. The quantitative and qualitative results generated from the HumMed analysis will be compared with the scores awarded by the standardized patients to the medical students after the structured interview and physical examination were completed. The HumMed pilot study will be successful if the results: (1) show relevant correlations with the SP evaluations, (2) provide new insights and feedback characterizing the humanistic and empathic behaviors of the medical students, and (3) uncover undiscovered empathic interaction patterns that can guide future medical training and mentoring.

VII. Dissemination of results. We will present the HumMed results at medical, education, and computing conferences. Stanford's TMA and VPTL seminar series will be key fora to organize special demonstration and presentations. Results will be shared with the Program Directors for the HHD and POM course at the School of Medicine.

VIII. Budget and Justification

	Item	Justification	Amount
Compensation			
Dr. Renate Fruchter	10%FTE Benefits	Project Director Research time to: - Coordinate the collaboration with the SoM partners to identify relevant SP-medical student recordings to be analyzed. - Test, expand, and implement the HumMed framework analytics and empathy indicators - Analyze pilot study 10 Mini CPX sessions – VPA, voice and body motion analysis	\$ 10,458.00 \$ 3,390.62
Professional Transcription of Mini CPX Sessions	10 one hour Mini CPX sessions at \$100 per hour	Professional Transcription of Mini CPX Sessions necessary for Video Protocol Analysis (VPA) of SP and medical student and voice analysis coding	\$1,000
		Total compensation	\$ 14,849
		Total request	\$14,849