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The hidden curriculum across medical disciplines: An examination of scope, impact, and context

Le curriculum caché dans les disciplines médicales : examen de sa portée, de ses incidences et de son contexte

Karen Schultz, Nicholas Cofie, Heather Braund, Mala Joneja, Shayna Watson, John Drover, Laura MacMillan-Jones and Nancy Dalgarno

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Article abstract

Background: While research suggests that manifestations of the hidden curriculum (HC) phenomenon have the potential to reinforce or undermine the values of an institution, very few studies have comprehensively measured its scope, impact, and the varied clinical teaching and learning contexts within which they occur. We explored the HC and examined the validity of newly developed constructs and determined the influence of context on the HC.

Methods: We surveyed medical students (n =182), residents (n =148), and faculty (n = 140) from all disciplines at our institution between 2019 and 2020. Based on prior research and expertise, we measured participants' experience with the HC including perceptions of respect and disrespect for different medical disciplines, settings in which the HC is experienced, impact of the HC, personal actions, efficacy, and their institutional perceptions. We examined the factor structure, reliability, and validity of the HC constructs using exploratory factor analysis Cronbach's alpha, regression analysis and Pearson's correlations.

Results: Expert judges (physician faculty and medical learners) confirmed the content validity of the items used and the analysis revealed new HC constructs reflecting negative expressions, positive impacts and expressions, negative impacts, personal actions, and positive institutional perceptions of the HC. Evidence for criterion validity was found for the negative impacts and the personal actions constructs and were significantly associated with the stage of respondents' career and gender. Support for convergent validity was obtained for HC constructs that were significantly correlated with certain contexts within which the HC occurs.

Conclusion: More unique dimensions and contexts of the HC exist than have been previously documented. The findings demonstrate that specific clinical contexts can be targeted to improve negative expressions and impacts of the HC.

Canadian Medical Education Journal

Original Research

The hidden curriculum across medical disciplines: an examination of scope, impact, and context

Le curriculum caché dans les disciplines médicales : examen de sa portée, de ses incidences et de son contexte

Karen Schultz,[1] Nicholas Cofie,[2] Heather Braund,[2] Mala Joneja,[3] Shayna Watson,[1] John Drover,[4] Laura MacMillan-Jones,[1] Nancy Dalgarno[1]

[1]Department of Family Medicine, Queens University, Ontario, Canada; [2]Office of Professional Development and Educational Scholarship, Faculty of Health Sciences, Queens University, Ontario, Canada; [3]Division of Rheumatology, School of Medicine, Faculty of Health Sciences, Queen's University, Ontario, Canada; [4]Departments of Critical Care Medicine and Surgery, School of Medicine, Faculty of Health Sciences, Queen's University, Ontario, Canada
Correspondence to: Dr. Karen Schultz, Associate Dean, Queen's University Post Graduate Medical Education, Professor, Queen's University Department of Family Medicine,70 Barrie Street, Kingston, Ontario, Canada K7L 3N6; phone: 613-533-2543; fax: 613-533-2132; email: karen.schultz@queensu.ca
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Abstract

Background: While research suggests that manifestations of the hidden curriculum (HC) phenomenon have the potential to reinforce or undermine the values of an institution, very few studies have comprehensively measured its scope, impact, and the varied clinical teaching and learning contexts within which they occur. We explored the HC and examined the validity of newly developed constructs and determined the influence of context on the HC.

Methods: We surveyed medical students (*n* =182), residents (*n* =148), and faculty (*n* = 140) from all disciplines at our institution between 2019 and 2020. Based on prior research and expertise, we measured participants' experience with the HC including perceptions of respect and disrespect for different medical disciplines, settings in which the HC is experienced, impact of the HC, personal actions, efficacy, and their institutional perceptions. We examined the factor structure, reliability, and validity of the HC constructs using exploratory factor analysis Cronbach's alpha, regression analysis and Pearson's correlations.

Results: Expert judges (physician faculty and medical learners) confirmed the content validity of the items used and the analysis revealed new HC constructs reflecting *negative expressions, positive impacts and expressions, negative impacts, personal actions,* and *positive institutional perceptions of the HC*. Evidence for criterion validity was found for *the negative impacts* and the *personal actions* constructs and were significantly associated with the stage of respondents' career and gender. Support for convergent validity was obtained for HC constructs that were significantly correlated with certain contexts within which the HC occurs.

Conclusion: More unique dimensions and contexts of the HC exist than have been previously documented. The findings demonstrate that specific clinical contexts can be targeted to improve negative expressions and impacts of the HC.

Résumé

Contexte : Bien que la recherche suggère que les expressions du curriculum caché (CC) ont le potentiel de renforcer ou de miner les valeurs d'un établissement, très peu d'études ont mesuré de manière exhaustive sa portée, ses effets et les divers contextes d'enseignement et d'apprentissage cliniques dans lesquels elles se produisent. Nous avons exploré le CC, examiné la validité de nouvelles notions et déterminé l'influence du contexte sur le CC.

Méthodes : Entre 2019 et 2020, nous avons interrogé des étudiants (n =182), des résidents (n =148) et des membres du corps professoral (n = 140) de notre établissement, toutes disciplines médicales confondues. Sur la base de recherches et d'expertises antérieures, nous avons mesuré l'expérience des participants par rapport au CC, y compris leurs perceptions du respect ou du non-respect des diverses disciplines médicales, les contextes dans lesquels ils ont été confrontés au CC, les effets et l'efficacité du CC, les perceptions de l'établissement et les actions personnelles des participants. Nous avons examiné la structure factorielle, la fiabilité et la validité des notions du CC à l'aide d'une analyse factorielle exploratoire, du coefficient alpha de Cronbach, d'une analyse de régression et des corrélations de Pearson.

Résultats : Des juges experts (médecins enseignants et apprenants) ont confirmé la validité du contenu des éléments utilisés et l'analyse a révélé de nouvelles notions du CC reflétant des expressions et des effets négatifs, des expressions et des effets positifs, des actions personnelles et des perceptions positives du CC au sein des établissements. La validité de critère a été démontrée pour les notions d'impacts négatifs et d'actions personnelles et a été associée de manière significative à l'étape de la carrière des répondants et à leur sexe. La validité convergente a été confirmée pour les notions de CC qui étaient significativement corrélées à certains contextes dans lesquels le CC se manifeste.

Conclusion : Il existe plus de dimensions et de contextes uniques du CC que ceux qui avaient été documentés par le passé. Nos résultats montrent que des contextes cliniques spécifiques peuvent être ciblés pour améliorer les expressions et les effets négatifs du CC.

Introduction

> *As much as I try not to internalize things I hear as a learner, it's hard not to get caught up in the culture I am immersed in.* (Medical Student)

> *We all need to respect each others' disciplines and the fact that all of our jobs are difficult in many ways. If we all showed more respect, and just assume our colleagues are doing the best they can, burnout would be less and patient care improved.* (Faculty)

As the above quotes illustrate, both medical students and faculty experience and acknowledge the existence of undesirable behaviours in the learning and clinical environment that are inconsistent with formal curricula and institutional values. Such behaviours have been described as indicators of the presence of the hidden curriculum (HC).[1,2] The HC phenomenon in medical education was first documented by Hafferty and Franks[2] who observed that most of the critical determinants of physician identity do not operate within the formal curriculum but in a more subtle and less officially recognized HC context. The HC includes intended and unintended implicit messages about values, norms, and attitudes that medical learners (medical students and residents) and practicing physicians (hereafter called faculty) infer from their interaction with role models, as well as from group dynamics, processes, culture, policies, structures, and systems.[3-5] Originally, the HC was described as a set of influences that function at the level of organizational structure and culture which reflects the understandings, customs, rituals, and taken-for-granted aspects of what occurs in the life-space we now call medical education.[6] The HC can either reinforce or undermine the formal values of medical education and clinical institutions.[1] As Holmes and colleagues point out, the HC may perpetuate not only desired attitudes and behaviours but also those that are less than desirable.[7] Prior research also demonstrates that the HC may encourage detrimental and condescending attitudes and behaviours that medical learners and physicians exhibit towards each other, in direct conflict with the values of equity, diversity, and inclusion that medical educational institutions espouse.[3,8] The HC can have adverse effects on learners' identity formation, professionalism, self-esteem, wellbeing, and productivity.[8] It can negatively impact faculty clinical productivity and wellbeing, thereby undermining the quadruple aim values of a well-functioning health care system.[9] Given the negative consequential effects of the HC,[10-12] it is important that steps are taken to fully identify, understand, and measure the HC phenomenon and its varied manifestations in medical education and practice. As Hafferty and Franks note, efforts at developing a comprehensive ethical curriculum must acknowledge the HC as well as the broader cultural milieu within which ethics teaching in medical education functions.[2]

A few studies have investigated and measured the HC in the medical education environment but have focused on patients, informal HC with medical students, and the HC in clinical settings.[3,5,13] Our study expands on these works by providing a more comprehensive measure of the many ways and contexts in which the HC may manifest. We measured medical students, residents, and faculty experience of the HC at the personal, institutional and organizational (micro, meso, macro) dimensions,[14] their perception of the respect and disrespect for medical disciplines, settings in which the HC is experienced, impact of the HC, personal actions, efficacy, and the varied contexts within which the HC occurs in relation to the collegial interpersonal and intra-professional interactions between medical learners and faculty. Guided by Kane's two-step approach to stating and evaluating validity evidence,[15,16] we explored the dimensions of the HC and assessed the validity of these dimensions in a unique sample and contexts of medical education and the clinical environment and make recommendations for future improvement. We present four constructs of the HC at the individual level including a unidimensional construct at the institutional level and evaluate the evidence for content validity, criterion validity, and convergent validity. Our evaluation of the validity evidence is guided by the following research questions:

Research questions

1. What dimensions or aspects of the hidden curriculum exist in the current sample of medical students, residents, and faculty?
2. Is the hidden curriculum experienced equally among medical students, residents, and faculty and across other groups in the current sample?
3. Are the dimensions of the hidden curriculum in the current sample influenced by the contexts where medical students, residents, and faculty learn and work?

Methods

Data

Online surveys were administered to medical learners (medical students and residents) and faculty within the School of Medicine in the Faculty of Health Sciences at Queen's University between 2019 and 2020. The surveys

were administered in Qualtrics (an online survey platform) and exported into Excel for cleaning and merging. A total of 470 respondents comprising medical students (*n* =182), residents (*n* = 148), and faculty (*n* = 140) participated in the survey, however, the analytic samples used in the current study are based on only observations with complete information (*n* = 395). All incomplete responses were therefore excluded from the analysis. Medical students included first, second, third, and fourth-year students. The resident sample included residents in their first, second, third, and senior years of residency. Faculty participants had years of experience ranging from less than 10 years, 10 to 25 years, and 25 years and above. Consistent with prior research on the HC, we collected information on gender as a discriminant variable to assess criterion validity.[4,17,18] Of the analytic sample, 242 identified their gender with 90 identifying as men and 137 as women. Fifteen identified as neither man nor woman or preferred not to state their gender. The survey collected information on medical learners and faculty perceptions and behaviours regarding the dimensions, consequences, and contexts of the HC resulting from attitudes and interactions between different areas of medicine in the School of Medicine at Queen's University. Items included in the survey were measured by two anchored Likert scales that measured respondents' HC related behaviour frequency (6-point scale: *never* to *very frequently*) and behaviour perception (6-point scale: *strongly disagree* to *strongly agree*). Ethics approval was obtained from the Queen's University Research Ethics Board.

Survey creation

A purposeful working group (*n* = 10) of hospital staff, medical learners , and faculty with diverse experiences in the educational/clinical environment was assembled. The group explored personal biases, reviewed, and defined the HC phenomenon based on prior experience and the extant literature on the topic.[1,3,5,8,9] Items measuring the HC (see Table 1a) were created to include measures involving implicit messages, intended and unintended, both positive and negative, about values, norms, and attitudes that members infer from their interaction with individual role models, as well as from group dynamics, processes, culture, policies, structures, and systems. Conceptually, these items reflect the variety of ways in which researchers have used the HC term in the literature including as an institutional-organizational concept, an interpersonal-social concept, a contextual-cultural concept, and a motivational-psychological concept.[5] The survey was also grounded in literature examining professional identity, behavioural learning, and situated learning as well as racism, gender, equity, diversity, and inclusion.[19-21] The survey was pre-tested (*n* = 10) using a think-aloud-protocol with medical learners and faculty to achieve both content and face validity.[22] As Boateng and colleagues note, pre-testing ensures that scale items are meaningful to the target population.[22] Medical learners and faculty were respectively used as expert judges and population judges to assess content and face validity of the HC items.[23,24] Expert judges are deemed to be highly knowledgeable about the domain of interest or scale development while target population judges serve as potential users of the scale.[22-24] Applying Guion's 5-steps approach[25] to ascertaining any claim of content validity in scale development, we ensured that our expert judges (faculty) agreed that (a) the behavioural content of the items included have a generally accepted meaning or definition; (b) the domains were unambiguously defined; (c) the content domains were relevant to the purposes of measurement; (d) the domains have been adequately sampled based on consensus; and (e) the response content was be reliably observed. This process, thus, produced content validity evidence that was supported by the relevance of the HC items used, the representativeness and quality of the HC items.[22] The empirical or theoretical basis for the items included are shown in Table 1a.

Table 1a. Literature or theoretical basis for including items measuring the hidden curriculum

Items	Concept
Experienced positive comments or behaviours because of my field of medicine.[19,26]	Respect for disciplines
Experienced negative comments or behaviours because of my field of medicine.[27,28]	Disrespect for disciplines
I have heard medical learners or faculty make positive comments or show respect towards a field/fields of medicine other than their own.[19,20,26]	Positive personal experience
I was denied opportunities.[27,28]	Negative personal experience
I was encouraged to pursue an opportunity.[28]	Positive personal experience
I was treated unfairly.[20,27,28]	Negative personal experience
I was valued for the work I do.[20]	Positive personal experience
I was made to feel incompetent or lazy.[20,27]	Negative personal experience
I was given less desirable jobs/tasks.[27]	Negative personal experience
I was made to feel that I was a part of the team/group.[20]	Positive personal experience
I have contemplated changing (or have changed) my field of medicine because of negative hidden curriculum.[27]	Self-efficacy
I have felt I should or I have concealed my field of medicine to minimize negative consequences for me.[29,30]	Self-efficacy
Having witnessed people acting respectfully towards those in other fields of medicine has positively changed my perception of that area of medicine.[29,30]	Self-efficacy
Having witnessed people acting disrespectfully towards those in other fields of medicine has negatively changed my perception of that area of medicine.[29,30]	Self-efficacy
I am collegial and professional about other areas of medicine.*[19,26]	Own actions
I am discourteous about other areas of medicine.[1,27,31]	Own actions
I have heard medical learners or faculty make negative comments or be disrespectful about a field/fields of medicine other than their own.[27]	Own actions
Some fields of medicine are respected more than others at own institution.*[27,31]	Institutional concept
Within fields of medicine with subspecialties (e.g., Medicine, Surgery) some subspecialties are respected more than others at our institution.*[32]	Institutional concept
Everyone who works here, no matter their area of medicine, has an equal chance to succeed at our institution.[33]	Institutional concept
Everyone who works here, no matter their area of medicine, is equally respected at our institution.[31]	Institutional concept
Our institution (university, hospital, etc.) equally values all fields of medicine both in words and actions.[34-38]	Institutional concept
Our governing bodies (OMA, CPSO, government etc.) equally value all fields of medicine both in words and actions.[35-38]	Institutional concept

*Notes: *Item was reverse coded.*

Analytical strategy

Inspired by Kane's model for evaluating validity evidence,[16,39] which involves scoring of items or assigning values to items, generalizing of scores, extrapolating, and drawing implications from the extrapolated findings, we generated evidence around choice of items through literature reviews and expert panel discussions. Further, we examined the factor structure, reliability, and validity of the HC constructs examined.[40] Guided by prior research,[5,41] an exploratory factor analysis via orthogonal varimax rotation and descriptive statistics were used to explore and assess the extent to which the HC was present in the current sample, both at the individual and organizational levels. Cronbach alpha reliability coefficients were estimated to examine the internal consistency of the factors extracted. As a measure of predictive criterion validity, multivariate linear regression models were estimated to determine whether the likelihood of experiencing the HC varies among subpopulation groups in the current sample. Also, as evidence for convergent construct validity, Pearson correlations were calculated to assess whether the newly extracted factors of the HC were influenced by the contexts within physician faculty and medical learners interact and work. All statistical analyses were done using SPSS and STATA.

Results

Dimensions of the HC in the current sample

The exploratory factor analysis (Table 1b) revealed four meaningful dimensions of the HC at the individual level based on factor loadings that were greater or equal to 0.50. Reliability coefficients for all extracted constructs ranged from acceptable[42] values of 0.50 and 0.86 with very high Eigen values ranging from 10.12 and 23.97.[43] These dimensions reflect: i) negative (factor 4) expressions of the HC, ii) positive impacts and expressions of the HC (Factor 2), iii) negative impacts of the HC (Factor 1), and iv) personal actions/behaviours (Factor3). The analytic sample appeared to be adequate and suitable with a Kaiser-Meyer-Olkin (KMO) index > 0.50 (0.83) and a significant Bartlett's Test of Sphericity (BTS) ($p < 0.001$).[41] Measuring the HC at the organizational level, , the unique organizational level items included in the factor analysis provided a one-factor solution and accounted for about 62% of the explained variance with relatively high factor loadings ranging from 0.65 and 0.87 and a reliability coefficient of 0.85. This unidimensional organizational level construct of the HC produced a KMO of 0.83 and a significant KTS ($p < 0.001$) and reflects respondents' positive perceptions about their institution in relation to the HC.

Table 1b. Descriptive statistics and factors for items measuring the hidden curriculum at the individual and institutional levels

	Descriptive statistics			Factor loadings				
				HC at the individual level				HC at the institutional level
Items (score range: 1- 6)	Mean	SD	N	Factor 1	Factor 2	Factor 3	Factor 4	
Experienced positive comments or behaviours because of my field of medicine.	4.35	0.92	222		0.65			
Experienced negative comments or behaviours because of my field of medicine.	3.27	1.40	222	0.60				
I have heard medical learners or faculty make positive comments or show respect towards a field/fields of medicine other than their own.	4.41	0.96	222		0.57			
I have heard medical learners or faculty make negative comments or be disrespectful about a field/fields of medicine other than their own.	4.25	1.22	222				0.58	
I was denied opportunities.	2.55	1.54	222	0.81				
I was encouraged to pursue an opportunity.	3.80	1.48	222		0.73			
I was treated unfairly.	2.64	1.52	222	0.80				
I was valued for the work I do.	4.00	1.38	222		0.57			
I was made to feel incompetent or lazy.	2.69	1.57	222	0.71				
I was given less desirable jobs/tasks.	2.82	1.65	222	0.79				
I was made to feel that I was a part of the team/group.	4.06	1.39	222		0.60			
I have contemplated changing (or have changed) my field of medicine because of negative hidden curriculum.	2.32	1.64	222			0.57		
I have felt I should or I have concealed my field of medicine to minimize negative consequences for me.	2.71	1.75	222	0.57				
Having witnessed people acting respectfully towards those in other fields of medicine has positively changed my perception of that area of medicine.	3.90	1.43	222			0.82		
Having witnessed people acting disrespectfully towards those in other fields of medicine has negatively changed my perception of that area of medicine.	3.45	1.59	222			0.79		
I am collegial and professional about other areas of medicine*	4.72	0.54	222				0.64	
I am discourteous about other areas of medicine.	2.51	1.05	222				0.81	
Some fields of medicine are respected more than others at own institution*	2.13	1.22	194					0.76
Within fields of medicine with subspecialties (e.g., Medicine, Surgery) some subspecialties are respected more than others at our institution.*	2.31	1.24	194					0.65
Everyone who works here, no matter their area of medicine, has an equal chance to succeed at our institution.	3.76	1.43	194					0.85
Everyone who works here, no matter their area of medicine, is equally respected at our institution.	3.21	1.43	194					0.87
Our institution (university, hospital, etc) equally values all fields of medicine both in words and actions.	3.20	1.47	194					0.87
Our governing bodies (OMA, CPSO, government etc) equally value all fields of medicine both in words and actions.	3.26	1.51	194					0.70
Cronbach's alpha				0.86	0.73	0.69	0.50	0.87
% of variance accounted for by each factor				23.97	12.13	11.72	10.12	61.88
Eigen values				5.47	2.037	1.04	1.37	13.71

Notes: [1]*Item was reverse coded.
[2] Factor loadings below 0.4 were ommitted.

Prevalence of the HC constructs and criterion validity among subpopulations

Overall, the positive impacts and impressions ($\bar{x}$ = 4.22, *SD* = 0.86), negative impacts ($\bar{x}$ = 3.29, *SD* =1.24) and personal actions ($\bar{x}$ = 3.90, *SD* = 1.04) dimensions of the HC appear to be the most prevalent in the current sample with high levels of variability (Table 2a). The positive impacts and expressions construct reflect respondents' experience of positive comments, behaviours, respect directed at their fields of medicine, encouragement to pursue opportunities, and the valuing of their work. On the other hand, negative impacts construct includes items that tap respondents' experience of negative comments, behaviours, unfair treatment, the denial of an opportunity, the giving of less desirable tasks and being made to feel incompetent or lazy. The personal actions construct reflects a series of behaviours or actions that respondents contemplated on as a result of their negative experience of the HC. Such actions include the thought of contemplating to change one's field of medicine because of one's experience of a negative HC. Based on prior research,[4,17,18] it was anticipated that different groups of populations may experience the HC disproportionately and therefore groups such as medical learners, faculty, men, women, and those identifying as non-binary would vary in their experience of the HC.

The experience of the HC among subpopulation groups: Evidence of criterion validity

Consistent with Haidet and colleagues' approach[13] to validating a patient-centered HC instrument, we assessed the criterion validity of the HC constructs. The multivariate regression results in Table 2b indicate that compared to residents, faculty were significantly less likely to report negative impacts of the HC (b = -0.43, p < 0.05) or take certain personal actions as a result of experiencing a negative impact of the HC (b = -0.28, p < 0.05). Medical students, on the other hand were more likely to report they were negatively impacted by the HC (b = 0.47, p < 0.05). Gender was found to be associated with a higher likelihood of experiencing negative expressions of the HC. Both women (b = 0.42, p < 0.05) and more particularly respondents identifying as nonbinary or preferring not to gender identify (b = 0.81, p < 0.05) were significantly more likely to have experienced negative expressions of the HC compared to their male counterparts (b = 0.47, p < 0.05).

Table 2a. Summative average scores by career stage and gender of respondents.

	Negative expressions of hidden curriculum		Positive impacts and expressions		Negative impacts of the hidden curriculum		Personal actions (behaviours)		Positve Institutional Perceptions	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Overall average factor scor	2.90	1.25	4.22	0.86	3.29	1.24	3.90	1.04	2.73	1.17
Career stage										
Residents	3.10	1.24	4.19	0.89	3.26	1.19	4.12	1.08	2.61	1.15
Faculty	2.72	1.24	4.00	0.90	2.86	0.92	3.67	1.00	2.67	1.12
Medical students	2.88	1.27	4.43	0.74	3.71	1.41	3.91	1.01	2.90	1.22
Gender										
Man	2.47	1.10	4.22	0.85	3.13	1.26	3.79	0.77	2.99	1.11
Woman	2.90	1.23	4.14	0.85	3.40	1.24	3.83	0.66	2.90	1.11
Non-binary	3.28	1.32	4.03	0.97	3.29	1.33	4.02	0.61	3.11	1.37
N	395		396		251		395		343	

Table 2b. Linear regressions predicting the likelihood of experiencing dimensions of the hidden curriculum

	Negative expressions of hidden curriculum		Positive impacts and expressions		Negative impacts of the hidden curriculum		Personal actions (behaviours)		Positve Institutional Perceptions	
	Coef(*b*)	S.E.	Coef(*b*)	S.E.	Coef(*b*)	S.E.	Coef(*b*)	S.E.	Coef(*b*)	S.E.
Career stage										
Residents (reference)										
Faculty	-0.32	0.19	-0.08	0.14	-0.43*	0.20	-0.28*	0.11	-0.10	0.18
Medical students	-0.18	0.19	0.34*	0.14	0.47*	0.20	-0.22*	0.01	0.16	0.18
Gender										
Man (reference)										
Woman	0.42**	0.16	-0.12	0.11	0.20	0.16	0.03	0.09	-0.11	0.15
Non-binary	0.81*	0.33	-0.15	0.23	0.26	0.34	0.22	0.19	0.16	0.31
Constant	2.65***	0.18	4.14***	0.12	3.14***	0.18	3.98***	0.10	2.97***	0.17
N	395		396		251		395		343	

Note: Significance: * p<0.05; ** p<0.01; *** p<0.001 indicate a predictor category is signficantly more likely to experience the specified dimension of the HC.

Relationships between the contexts within which the HC occurs and dimensions of the HC

As evidence of convergent validity, we explored whether respondents' experience of the HC was influenced by the contexts within which various forms of the HC occurs. Convergent validity is a type of construct validity which assesses the degree to which scores on a studied instrument are related to measures of the other constructs that can be expected on theoretical grounds to be close to the one tapped into by the instrument.[22,44] It was anticipated that because the HC manifests in unique teaching and learning and clinical contexts, the extracted HC constructs will be significantly correlated with measures of these contexts. In Table 3, we assessed evidence of convergent validity and examined correlations among the several types of contexts and the five constructs of the HC. Consistent with expectations, the results show that the hearing of positive comments in clinics, wards, operating or delivery rooms, emergency department, ICU as well written and verbal patient-care communications are positively and significantly correlated with the *positive impacts and expressions* dimension of the HC. Similarly, the results reveal that the hearing of negative comments in the same set of contexts significantly and positively correlated with the *negative expressions, negative impacts, and personal actions* dimensions of the HC. At the organizational level, such negative comments were found to be inversely correlated with the *positive institutional perceptions* construct of the HC which includes items reflecting the giving of equal opportunity and respect to medical leaners and faculty regardless of their fields of medicine.

Table 3 further shows that positive comments about different areas of medicine heard in contexts including classrooms, small groups teaching sessions, simulation teaching, case-based learning, grand rounds, hallways, skit rounds, and informal conversations were significantly correlated with positive impacts on people but not with other dimensions of the HC, except grand rounds and skit rounds which appear to be unexpectedly correlated with *negative impacts* of the HC. On the contrary, however, negative comments heard in these contexts appear to be consistently correlated with all the dimensions of the HC in the expected directions, both at the individual and organizational levels. For example, negative comments overheard or directed at people in such settings were significantly and positively correlated with negative impacts on people, negative personal actions, and inversely correlated with favorable perceptions of their institution.

Table 3. Correlations among extracted factors and contexts within which the hidden curriculum occurs

	Factors extracted from factor analysis				
	Negative expressions of hidden curriculum	Positive impacts and expressions	Negative impacts of the hidden curriculum	Personal actions (behaviours)	Positive Institutional Perceptions
Heard positive comments in:					
Clinic	-0.046	.276**	-0.028	0.017	0.044
Ward	0.015	.327**	0.038	0.030	0.045
Operating or delivery room	0.030	.211**	-0.001	-0.006	0.073
Emergency Department	0.062	.173**	0.073	0.122	-0.029
ICU	0.052	.226**	-0.007	0.014	0.029
Written patient-care communication (e.g., consult letters)	0.013	.212**	0.015	-0.028	0.028
Verbal patient-care communication (e.g., patient handover, urgent consultations)	-0.007	.165**	0.028	0.041	-0.022
Heard negative comments in:					
Clinic	.369**	-.173**	.146*	.412**	-.315**
Ward	.313**	-0.066	.237**	.415**	-.309**
Operating or delivery room	.255**	0.045	.186*	.324**	-.240**
Emergency Department	.254**	-0.052	.151*	.370**	-.286**
ICU	.192**	-0.003	0.072	.290**	-.260**
Written patient-care communication (e.g., consult letters)	.420**	-.228**	.172**	.320**	-.356**
Verbal patient-care communication (e.g., patient handover, urgent consultations)	.436**	-.149*	.254**	.398**	-.487**
Heard positive comments in:					
Classrooms	-0.054	.255**	0.068	-0.096	0.049
Small group teaching sessions	0.010	.201**	0.116	-0.086	0.053
Simulation teaching, including clinical skills	0.037	.170**	0.085	-0.066	0.023
Case-based learning	-0.033	.165**	0.107	-0.114	0.057
Grand Rounds	-0.071	.237**	.176**	-0.102	-0.013
Heard negative comments in:					
Classrooms	.408**	-.128*	.268**	.394**	-.299**
Small group teaching sessions	.431**	-.151*	.191**	.426**	-.361**
Simulation teaching, including clinical skills	.414**	-.142*	.254**	.398**	-.398**
Case-based learning	.400**	-.133*	.239**	.413**	-.355**
Grand Rounds	.316**	-0.098	0.120	.398**	-.326**
Heard positive comments in:					
Hallways, cafeteria, etc	0.023	.228**	.140*	-0.049	0.005
Variety Night, Skit Rounds, etc.	0.046	.249**	.161*	0.096	-0.010
Informal conversations	0.020	.216**	0.070	-0.058	-0.027
Heard negative comments in:					
Hallways, cafeteria, etc.	.345**	-0.117	.253**	.422**	-.390**
Variety Night, Skit Rounds, etc.	.243**	-0.048	.213**	.361**	-.239**
Informal conversations	.387**	-.200**	.293**	.522**	-.414**

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Discussion

This study explores the dimensions of the HC phenomenon and examines the validity of newly developed constructs of the HC in a unique sample of medical leaners and faculty within the clinical teaching and learning environment. In assessing the dimensions of the HC, we focused on interactions between learners and faculty in different medical disciplines and the many contexts within which they learn or practice. Guided by prior research and our analytical framework, we discovered five main constructs of the HC, four at the individual level and one at the organizational level. We assessed the content validity of the items as well as the criterion validity of the HC constructs and assessed convergent validity by determining whether the constructs of the HC were influenced by the contexts within which medical learners and interactions take place.

The newly extracted constructs captured unique dimensions of the HC including negative expressions, positive impacts and expressions, negative impacts, and personal actions/behaviours at the individual level. Items measuring the HC at the organizational level provided a one-factor solution to the latent construct and reflected perceptions of the HC at the institutional level. The factor loadings for each construct appeared to be generally high and acceptable with high degrees of internal consistency. Consistent with professional identity formation processes in medical education,[19,26] the *positive impacts and expressions* construct reflected medical learners and faculty's lived experiences of the HC that were deemed favorable. Such positive experiences included positive comments, behaviours, encouragements, and respect directed at their fields of medicine. The *negative impact* construct tapped various forms of undesirable[28] and micro aggressive behaviours[27] that manifested in the form of unfair treatment, the denial of an opportunity, the giving

of less desirable tasks, being made to feel incompetent or lazy and other negative comments directed at respondents. The *personal actions* construct reflected respondents' self-efficacy abilities[29,30] to initiate specific actions following their experience of negative manifestations of the HC. Such actions included the thought of contemplating and changing one's field of medicine or developing a negative perception for disrespected disciplines. Experiences such as hearing negative comments and the demonstration of disrespect and being non-professional or non-collegial toward other disciplines loaded onto the *negative expressions* construct. The unidimensional construct at the organizational level revealed medical learners and faculty's positive perceptions of the HC at their institution.

Of the five constructs discovered, the construct reflecting positive impacts and expressions of the HC appeared to be most prevalent in the current sample than the other dimensions. This finding is consistent with prior research that reported, for example, that the most influential medical student experiences of the HC were positive examples of the hidden or informal curriculum.[20] Evidence for criterion validity was found for the negative impacts and the personal actions constructs as they were significantly predicted by the stage of respondents' career and gender. The finding that medical faculty were less likely to report negative impacts of the HC or take personal actions to ameliorate negative experiences of the HC is consistent with research that suggests that faculty may often be the transmitters or perpetrators of undesirable professional attitudes and behaviours, particularly those that are negative role models to medical learners.[7] Similarly the finding that medical students are more likely report a higher likelihood of being negatively impacted by the HC could provide an opportunity to target medical students as agents for change in addressing the negative manifestations of the HC. As others note,[7,45,46] educating medical students who are the next generation of physicians could provide a better alternative mechanism to addressing negative physician attitudes and behaviours than focusing on previous approaches that placed a disproportionate emphasis on continuing professional development of individual physicians to change their behaviour. Our findings also revealed that compared to men (medical learners and faculty), women or respondents identifying as non-binary or preferring not to identify demonstrated a higher likelihood of experiencing negative expressions of the HC. This gender-based difference is consistent with research that documents incidents of biased treatment and sexual harassment against women and the ridiculing of those who identify as non-binary genders in medical institutions.[18] Similarly, others point out that a negative HC may play a role in deterring female learners from considering surgical specialties.[4] In assessing the influence of the varied clinical teaching and learning environments on the likelihood of experiencing the HC, we found strong correlations between settings in which positive comments were heard and positive impacts and expressions of the HC as evidence of convergent validity. Likewise, the evidence demonstrates that hearing negative comments in clinical and teaching as well as informal settings are more likely to be significantly correlated with negative expressions and impacts of the HC, albeit the strength of the correlation may vary at the individual and organizational levels of the HC. The observed patterns for the influence of contexts have implications for addressing the HC. The analysis presented in this study clearly reveals specific settings that correlate with both positive and negative expressions and impacts of the HC. For this reason, efforts geared at reducing the negative consequences of the HC could, for example, target interactions occurring in these specific settings including clinics, wards, operating rooms, emergency departments and ICUs and informal settings.

Strengths and limitations

This study has attempted to provide a broader conceptualization and measurement of the HC phenomenon in a broad sample of medical learners and faculty who interact and work in diverse clinical contexts. We deliberately chose a working group with informed and varied perspectives about the HC (consisting of medical students, residents and mid and late career faculty from specialties anecdotally thought to be more impacted by the HC (family medicine and psychiatry) and those thought to be less impacted (internal medicine, surgery and critical care) and reflected on our individual and organizational experiences of the HC coming into this work. We do, however, acknowledge being personally impacted by the HC and realize that our experience may not mirror those in other institutions and/or countries. Our diverse HC working group ensured that we had informed and varied perspectives in the development of the HC survey. We explored all medical disciplines (family medicine, surgery, anesthesiology, internal medicine, emergency, medicine, critical care, public health and prevention, physical and medical rehabilitation, pathology, psychiatry, radiology, ophthalmology, pediatrics, urology, obstetrics, and

gynecology) at our institution and looked for the HC at the personal and organizational levels. Unlike prior research, we measured both negative and positive dimensions of the HC and anticipate that the inclusion of the latter might generate new insights that could influence positive behavioural change among medical learners and practitioners. A limitation of this study is that it was conducted at only one institution, and this may limit generalizability of our findings to other contexts.

Conclusion and directions for future research

More unique dimensions and contexts of the HC exist than have been previously documented. The measures examined in this study may be useful to medical educators, researchers, and policy makers who are concerned about the presence of the HC in their institutions. Addressing the HC will require such stakeholders at medical institutions to initiate a culture shift and deliberately embrace change management principles that pay attention to the micro, meso, and macro levels where the HC is present. Also, since most physicians and learners at medical institutions are well-intentioned and collegial, efforts aimed at addressing the negative aspects of the HC should strike a balance between celebrating positive examples of the HC and the need to educate, remediate and even terminate the employment of those who demonstrate a sustained inability to embrace the commonly shared values of respect, collegiality, and diversity.

The findings demonstrate that specific clinical contexts can be targeted to address or improve the negative expressions and impacts of the HC. The HC has been largely understudied particularly due to the lack of a comprehensive validated instrument on the subject. The findings of this initial study add to the extant literature. We anticipate that researchers and other institutions can adapt the HC measures explored here and add questions specific to their contexts as appropriate. Such questions should align with an appropriate conceptual framework from which the constructs were derived. As direction for future research, we anticipate that future studies will measure and assess the negative expressions and impacts of the HC on the well documented quadruple aim of health care delivery that focuses on health care team morale, health outcomes, costs, and patient experiences.[47-50]

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