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To cite this article: Kylie J. Mansfield, Anita Iversen & Maja-Lisa Løchen (2024) Regional, rural and remote medicine attracts students with a similar approach to learning in both the Northern and Southern hemisphere, International Journal of Circumpolar Health, 83:1, 2404274, DOI: [10.1080/22423982.2024.2404274](https://doi.org/10.1080/22423982.2024.2404274)

To link to this article: <https://doi.org/10.1080/22423982.2024.2404274>



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Published online: 16 Sep 2024.



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Regional, rural and remote medicine attracts students with a similar approach to learning in both the Northern and Southern hemisphere

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ABSTRACT

Doctors who work in areas of workforce shortage, such as regional, rural and remote areas or areas of low socioeconomic means need to be more self-motivated, adaptable and self-directed than their metropolitan counterparts. This study aimed to examine the goal orientation and learning characteristics of students recruited into two medical programmes, one from the Northern hemisphere and one from the Southern hemisphere; both with a commitment to producing doctors to practice medicine in rural locations. Three survey tools were administered to 263 medical students: 1. achievement goal orientation survey; 2. learning characteristics survey and 3. the study process questionnaire. Medical students from both cohorts showed a learning goal orientation, which significantly increased with age ($P < 0.007$). In terms of learning characteristics, the students from the south had significantly higher scores for curiosity ($P < 0.003$), while the northern students had significantly higher scores for methodical ($p < 0.001$). Both cohorts were similar for adaptability and conscientiousness. Across the entire student cohort, three of the four learning disposition characteristics were also seen to correlate with learning goal orientation. In both cohorts of medical students deep learning scores exceeded surface learning scores. Selection of students with a learning goal orientation and learning characteristics of curiosity, adaptability and conscientiousness could potentially help students to flourish in rural placement environments.

ARTICLE HISTORY

Received 14 June 2024
Revised 6 September 2024
Accepted 10 September 2024

KEYWORDS



Learning goal orientation; medical students; curiosity; rural practice; self-directed learning

Introduction

The World Health Organisation has identified that globally shortages of health professionals in rural area limits access to health services for these populations [1]. A number of strategies have been recommended to increase the availability of healthcare workers in rural locations. These include recruitment of students from a rural background into medical schools [2,3] and incorporation of rural experiences in medical education programmes [4]. Indeed, the World Health Organization has recommended that medical programmes be revised so that they include rural experiences and produce doctors that meet the needs of rural and remote populations [1]. Unfortunately, there is limited evidence available to guide the development of curricula that deliver more than experiences of health care conducted in rural locations [5].

Doctors who work in rural areas have different roles and scopes of practice compared to their metropolitan counterparts. Doctors in rural areas are often isolated and need to be independent and self-directed [6]

because of the limited support workforce available in these areas [7]. This professional isolation is highlighted by the statistics in Australia where around 80% of Australian doctors practice in metropolitan areas [8] with small rural towns having the lowest full time equivalent medical workforce of all the regions [9]. Similarly, in rural and remote areas of Norway, there is low growth in the population [10] together with an increasingly unstable health workforce, especially general practitioners (GPs) in small rural and remote areas [11]. However, it is not just doctors that are limited in rural areas but also allied health professionals [9]. Therefore, rural doctors need to have a broad scope of practice as they may be required to provide services that would be provided by allied health professionals in an urban area [7]. The doctors that are required in rural areas are true generalists [12]. As well as having the consciousness expected of all doctors, these clinicians are self-motivated, adaptable and prepared for the transdisciplinary nature of rural health roles [13].

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The workforce shortages in rural areas may limit the availability of teaching resources available to students who undertake placement in rural sites. Therefore, students who will undertake placements in rural areas need to be independent and willing to take responsibility for their learning [14]. Many students will find the opportunity of rural placements rewarding and enjoy the autonomy and the prospect to take initiative and be innovative [13,15,16], finding that the greater autonomy in rural contexts is an excellent opportunity to learn [13,15,16], however, some students feel underprepared for rural environments and find the requirement for self-direction overwhelming. Conversely, some students may find the challenges of undertaking placements in a busy metropolitan hospital challenging and find it easy to get overwhelmed in this environment [17].

The different response to the challenges of rural placements lies in some part with the students' individual motivation for learning. The common learning motivations described in the literature are learning goal orientation and performance goal orientation [18,19]. Learning goal orientation relates to a student's desire to acquire new knowledge, to increase competence and to understand new concepts. Students with a learning goal orientation tend to have a strong self-efficacy and exhibit more adaptability in responses to challenges [20]. These students are more likely to self-motivate, use a diversity of learning approaches and demonstrate perseverance [21]. Students with a learning goal orientation are, therefore, likely to be able to flourish in clinical placements in areas of workforce shortage, such as a rural environment or areas of low socioeconomic means.

In contrast, students with a performance goal orientation are focused on getting the right answer, they are aiming to demonstrate their ability and to seek favourable feedback from others [22]. When a positive comparison is taken away they flounder. Students with a performance goal orientation tend to be more anxious about learning new skills [23] and are more likely to feel overwhelmed in challenging situations [20]. In terms of rural placements, it is likely that students with a performance goal orientation will find the autonomy and need for self-direction less rewarding than urban-based placements. They may also find it challenging to work in placements where resource restrictions meant they did not receive the attention they desired from placement supervisors [24].

This study was undertaken by students enrolled in two medical programmes, University of Wollongong (UOW, Australia, South) and UiT The Arctic University of Norway (Norway, North). Both programmes have

a commitment to producing doctors who are ready and willing to practice medicine in rural and regional locations. In addition, both programmes have a commitment to recruitment of rural origin students and have significant expectations for students to undertake clinical placements in rural sites. The aim of this study was to examine the goal orientation and characteristics of students recruited into these two geographically separate medical programmes.

Methods

Context

This study was conducted at two universities: The University of Wollongong (UOW) in Wollongong, Australia (South) and UiT The Arctic University of Norway located in Northern Norway (North). These schools chose to collaborate on this project as both medical schools have a mission to produce doctors with a desire to practice in rural communities. The National Centre for Rural Medicine located at UiT The Arctic University of Norway was established to contribute to recruitment, stability and quality in rural health care [6]. Similarly, the Graduate School of Medicine at the University of Wollongong was established with a commitment to graduate excellent medical practitioners who have the capacity and desire to contribute to the enhancement of health care of persons in all geographic settings, but particularly in regional, rural and remote communities [25].

The study was approved by the Human Research Ethics Committee at UOW [HREC 2012/329] and the Norwegian Centre for Research Data [Project number 49,103]. At both sites, the questionnaires were administered by face-to-face distribution of the surveys during scheduled class time or easily accessed online from the students' website. All the participants were provided with the same background to the study and instructions for completing the questionnaire. All surveys were administered in English. The Norwegian students have a high level of English language literacy. To determine if administration of the survey in English would be a problem for the Norwegian medical students a pilot was conducted prior to the study. Norwegian medical students who participated in the pilot did not consider that completing the survey in English would be a problem for their peers. All students who participated in the project were enrolled in medical programmes at their respective Universities. All surveys were anonymous, with age and gender the only identifying information collected.

Student participants from UiT (North) were enrolled in the medical programme at the Faculty of Health Sciences, a 6-year long, undergraduate entry medical programme. Entry into medicine at UiT requires completion of compulsory subjects from high school including mathematics, physics and chemistry. In addition, 60% of the cohort have a place of origin in northern Norway. A quota of places is also allocated to students of Sami origin and for students who are from extreme northern regions. The original goal of the UiT medical programme was to provide access to academic education for young people in Northern Norway and to improve access to doctors and health care for the underserved rural population of Northern Norway. The UiT medical curriculum aims at integrating clinical and science teaching as well as community medicine and primary health care. There is a focus on small group teaching, casework, placements in local hospitals and general practice. Across two years, all first year, students 220 medicine students (113 in 2016 and 107 in 2018) at UiT were invited to participate in an online survey. The survey was available two weeks after they commenced in the first year of their medical studies.

Student participants from UOW (South) were enrolled in the Doctor of Medicine programme in the Faculty of Science, Medicine and Health, a 4 year long, graduate entry medical programme. As a graduate entry programme entry into medicine at UOW requires completion of a previous university degree, with no prescribed study area or pre-requisites for entry. There is no specification about the discipline for the previous degree. Students are admitted to the programme based on academic selection measures (grade point average from their previous bachelor's degree, GPA and GAMSAT). The Graduate Medical School Admissions Test (GAMSAT) is designed to assess the capacity of applicants to undertake high-level intellectual studies in the medical and health professional programmes. GAMSAT evaluates the mastery and use of concepts in basic science as well as the acquisition of more general skills in problem solving, critical thinking and writing. In addition, selection into the UOW MD includes non-academic selection measures (Multiple Mini Interview (MMI) and UOW admissions portfolio). The UOW MD Admissions portfolio was developed based on the initial work assessing "Rural and Remote Suitability" for students in northern Canada [26]. The portfolio assesses applicants in the fields of leadership, service ethic, teamwork, diversity of experience, high achievement in a field of human endeavour and academic experience. At selection students are also classified as being from a rural background [27] with approximately 55% of the UOW MD cohort coming from a rural

background. The mission of the UOW MD is to train Australian doctors with a desire to practice medicine in regional/rural areas and a commitment to disadvantaged communities. The curriculum aims at integrating clinical and science teaching as well as community medicine and primary health care. Teaching features small group and case-based learning, placements in local hospitals and general practice. Across two years, all first year medicine students at UOW were invited to participate in the survey ($n = 165$) (83 in 2012 and 82 in 2014). The survey was distributed face to face at the conclusion of a teaching session. The survey was administered during the first two weeks after they commenced in the first year of their medical studies.

Survey instruments

An achievement goal orientation survey was also completed by the students. This survey was originally designed by Button et al. [19] and used previously by to quantify student achievement orientations [21,28]. The survey was administered as validated for medical students using a 7-point Likert scale [28]. The survey responses have been validated for two factors: learning goals orientation and performance goal orientation which are each calculated by the aggregating Likert scores for eight individual questions. The maximum for each goal orientation is 56. In order to identify an individual's preference for a learning goal orientation, the score for performance goal orientation was subtracted from the score for learning goal orientation (as described [21]).

A second component of the achievement goal orientation survey was questions relating to learning characteristics. This survey, originally designed by Dawson [21] has been used previously to quantify the learning disposition of medical students. The learning disposition survey included 21 characteristics, and students were asked to indicate, on a 7-point likert scale, how much these characteristics described themselves as a learner. Exploratory factor analysis (SPSS) of this part of the survey resolved into four factors: curiosity, adaptability, consciousness, and methodical (Table 1). To allow comparison between the different characteristics the scores for the individual factors were added, or subtracted for the two factors that were negative (-ve) contributors and then divided by the number of factors included in that characteristic, giving a characteristic score out of 7.

Finally, the revised two factor study process questionnaire: R-SPQ-2F was used in this study [29]. This has previously been used to assess the learning approach of medical students [28,30]. The R-SPQ-2F

Table 1. Exploratory factor analysis grouping of the survey categories from the learning disposition survey.

Characteristic	Factors included
Curiosity	Inquisitive, inquiring, questioning, curious, investigative, intellectually active, scrutinizing
Adaptability	Imaginative, inventive, creative, experimenting, spontaneous
Conscientiousness	Conscientious, unpredictable (–ve contributor), bored (–ve contributor), serious
Methodical	Routine, unoriginal, serious, restrained

questionnaire required participants to respond to 20 items using a 5-point Likert scale. This questionnaire has been validated into two main factors: deep approach and surface approach each derived from 10 items [29,31]. The maximum for each learning approach is 50. As these deep and surface approaches are calculated by aggregating Likert scores from individual questions, students can present with high scores for both factors. This study was interested in the preferred learning approach, therefore the deep preference was determined by subtracting the score for surface approach from the score for deep approach.

Data analysis

Statistical analysis was undertaken using GraphPad Prism 10.1.2 (Graphpad Software, San Diego, CA, USA). Comparisons between the responses from the two universities were made using unpaired t-tests. All data are expressed as mean (\pm SEM) and alpha was set as $p < 0.05$.

Results

In total 263 medical students completed this survey, 110 (response rate 50%) from the North and 153 (response rate 92%) from the South. The differences in response rate likely reflect the different methods used to distribute the surveys at the two sites. Online surveys are known to elicit a lower response rate compared to face-to-face distribution [28]. The average age of the two cohorts was representative of the student cohort enrolled at the individual universities. As expected, the northern students who are enrolled in an undergraduate entry programme were significantly younger (21.31 ± 0.33 years) than the southern students (26.17 ± 0.39) who are enrolled in the graduate entry programme ($p < 0.0001$). There was also a higher proportion of female students who responded to the survey from the northern cohort (75% compared to 53%). The proportion of female students from each cohort is representative of the makeup of the student cohorts enrolled in the two programmes (North \sim 70% female, South \sim 50% female).

Both cohorts of medical students showed a goal orientation in favour of learning as indicated by their higher scores in learning orientation over their scores for performance orientation (Figure 1a). Southern students had significantly higher scores for learning goal orientation ($P 0.011$). There were no significant difference in their performance goal orientation ($P 0.087$). Taken together this resulted in the southern students having a significantly higher preference for learning over performance ($P 0.0029$). These differences between the northern and southern students may be due to the finding that goal orientation is affected by age. Learning goal orientation significantly increased with age (Figure 1b, slope 0.19, $r^2 = 0.027$, $P 0.007$), while the reverse was true for performance goal orientation, which significantly decreased with age (Figure 1c, slope -0.21 , $r^2 = 0.021$, $P 0.019$). Similar to learning goal orientation, the learning goal preference also significantly increased with age (Figure 1d, slope 0.39, $r^2 = 0.044$, $P 0.0006$).

In terms of learning disposition, the students from the south had significantly higher scores for curiosity ($P 0.0033$, Table 2), while the northern students had significantly higher scores for methodical ($p < 0.001$). Both cohorts were similar for adaptability and conscientiousness. The difference in learning disposition between the student cohorts is perhaps explained by the correlation of three of the four characteristics with age (Figure 2). Curiosity was seen to significantly increase with age (Figure 2a, $p < 0.0001$) as was adaptability (Figure 2b, $P 0.044$) while methodical significantly decreased with age (Figure 2d, $P 0.039$). There was no significant age-related change seen for conscientiousness (Figure 2c, $P 0.314$). There were also significant differences in terms of the learning disposition factors with gender (Table 2) with females scoring slightly (male mean 4.233, female mean 4.386) but significantly higher for conscientiousness ($p < 0.0001$).

Across the entire student cohort, three of the four learning disposition characteristics were also seen to correlate with learning goal orientation (Table 2). The highest correlation was seen for curiosity ($r^2 0.239$, $p < 0.0001$), followed by conscientiousness ($r^2 0.135$, $p < 0.0001$). Adaptability demonstrated a significant correlation with learning goal orientation, however, the

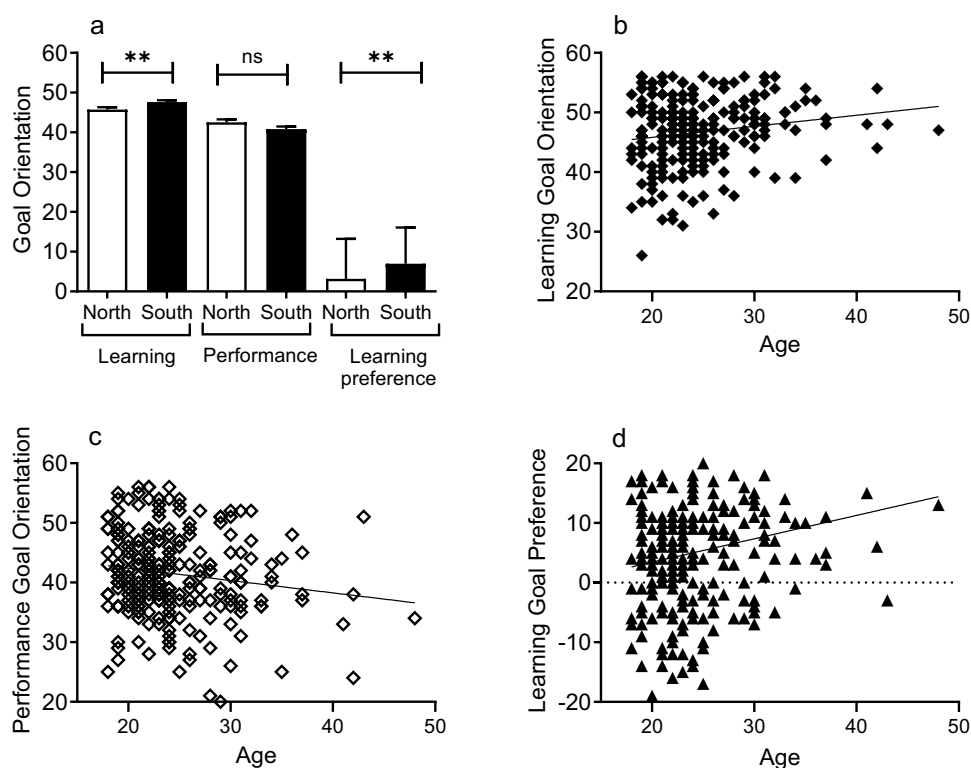


Figure 1. a. Goal orientation in medical students from north (UiT) and south (UOW) including learning goal orientation, performance goal orientation and learning goal preference of student participants. Across all students (including both northern and southern students) goal orientation was seen to change with age. b. Learning goal orientation positively correlated with age, c. performance goal orientation negatively correlated with age and d. learning goal preference positively correlated with age.

Table 2. Exploratory factor analysis of learning characteristics in the learning dispositions survey.

Characteristic	Combined	North (UiT)	South (UOW)	P (North vs South)	P (Male vs Female)	Correlation with Learning Goal Orientation
Curiosity	5.31 ± 0.05	4.76 ± 0.15	5.43 ± 0.06	0.0001	0.11	Slope 0.065, r^2 0.239, $p < 0.0001$
Adaptability	4.59 ± 0.07	4.4 ± 0.13	4.64 ± 0.09	0.123	0.13	Slope 0.039, r^2 0.047, P 0.0004
Consciousness	4.72 ± 0.05	4.81 ± 0.09	4.64 ± 0.07	0.153	<0.0001*	Slope 0.053, r^2 0.135, $p < 0.0001$
Methodical	4.34 ± 0.06	4.64 ± 0.09	4.12 ± 0.08	<0.0001	0.23	Slope 0.0076, r^2 0.0023, P 0.4381

Data presented as mean ± SEM; All scores are out of a total score of 7.
*Females significantly higher.

correlation was reduced compared to curiosity and consciousness (r^2 0.047, P 0.0004). Only methodical was not seen to significantly correlate with learning goal orientation, however methodical did significantly correlate with performance goal orientation (slope 0.033, r^2 0.059, $p < 0.0001$). None of the other learning characteristics were seen to correlate with performance goal orientation.

In both cohorts of medical students deep learning scores exceeded surface learning scores (Figure 3a). Medical students from both north and south had similar scores for deep learning (P 0.64), however, the northern students had significantly higher scores for surface learning ($p < 0.0001$). Together this resulted in the

southern students having a higher deep preference (P 0.0008). This could be due to the significant difference in the age of the two cohorts as surface approaches to learning were seen to significantly decrease with age (Figure 3b, r^2 0.12, $p < 0.0001$). No significant change with deep approaches to learning with age were observed (Figure 3b, r^2 0.019, P 0.085).

Discussion

This study, conducted by two schools with a commitment to producing doctors who are ready and willing to practice medicine in rural and regional locations aimed to examine the learning goal

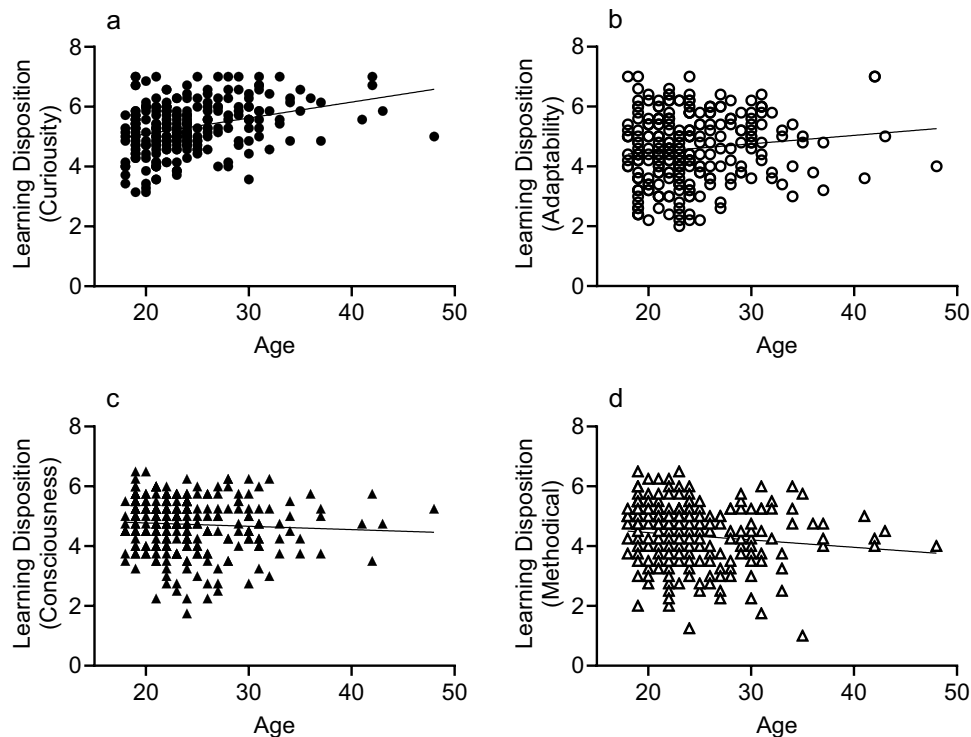


Figure 2. Correlation of the individual learning disposition characteristics with age. Two of the four learning characteristic significantly increased with age, a) curiosity (slope 0.053, r^2 0.1007, $p < 0.0001$) and b) adaptability (slope 0.028, r^2 0.015, P 0.044). c) consciousness demonstrated no age-related change (slope -0.011 , r^2 0.003, P 0.314) and d) methodical significantly decreased with age (slope -0.02 , r^2 0.016, P 0.039).

orientation and characteristics of students recruited into these separate medical schools and evaluate how these characteristics prepared students for rural clinical practice.

A number of features have been identified to help students along the pathway towards future rural practice [27]. Perhaps, the easiest of these is the selection of students from a rural background into the medical programmes [32,33]. In terms of rural background both medical schools in this study have approximately 60% of the students coming from a rural area. The second key feature that has been shown to increase the likelihood of future rural practice is a positive experience of rural medicine during medical school [32–39]. This feature is much more nuanced in terms of how it impacts on likelihood for future rural practice as it involves the interaction of student characteristics, student preparedness for teamwork and the training environment [34]. The current study proposes that one feature that can enhance the experience of medical students on rural placements is having an underlying learning motivation that will allow students to feel confident on these placements and make the most of the opportunities available.

Similar to many other areas of medicine, rural clinical practice requires strong skills in autonomy,

independence and self-directed learning [40]. In medical students, these characteristics are associated with a learning goal orientation [41]. The current study has shown that the students selected for admission into these rurally focused medical programmes (north and south) had a preference for learning goal orientation. This is not unique to the Universities in Tromsø and Wollongong as a similar goal orientation has been reported for medical students from other medical schools (for example, schools in California USA, [42]). While this study did not measure student performance in rural clinical placements, we would suggest that the preference for a learning goal orientation will give students the underlying characteristics required to perform on rural clinical placements.

In environments of workforce shortage, such as rural or regional healthcare settings or areas of low socio-economic resources, students are valued by health professionals [13,15,43] and members of the community [13,44] and are seen as part of the clinical team. On such placements, students need to quickly accept responsibility (often independently) for management and transfer of patients [45–47], management of minor procedures [47] and early adoption of health leadership roles through advocacy [45,46].

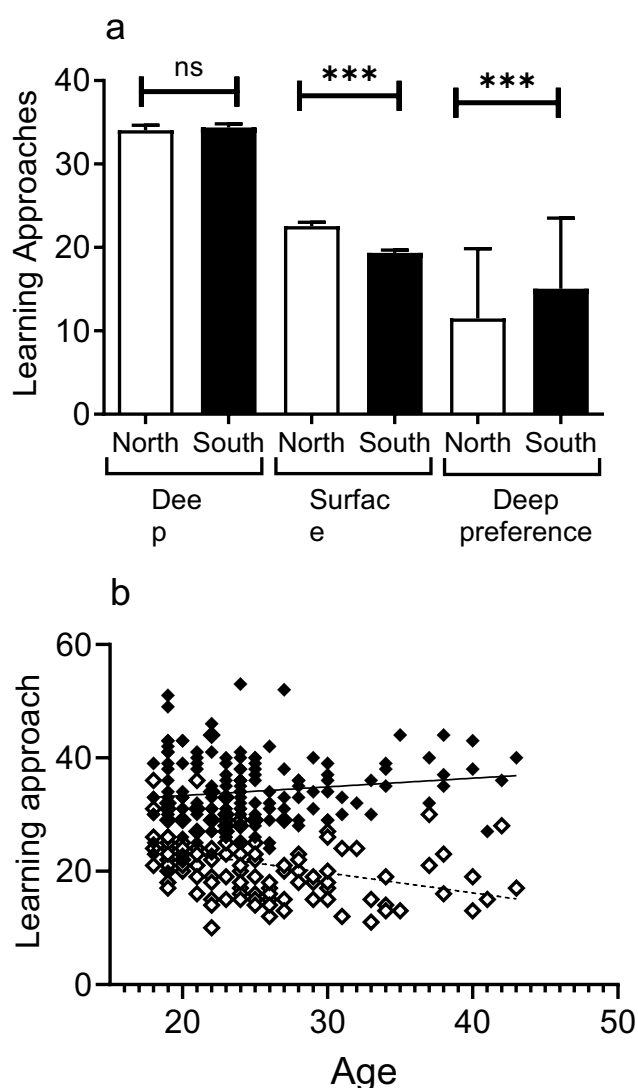


Figure 3. Learning approach of medical students from North and south. a learning preference together with deep and surface learning approach. b correlation of deep (◆) and surface (◊) approaches to learning with age.

In this situation, a student with a performance goal motivation may struggle to obtain necessary feedback due to shortage of specialists and limited resources. Preceptor workload and a lack of designated teaching time may be problematic for students with a performance goal motivation [16,47–49] and may lead to them feeling overwhelmed and failing to gain the most from learning opportunities [15,47]. In addition, their natural competitiveness may not allow them to work effectively in interprofessional teams. In contrast, a learning goal motivation is beneficial as individuals with a learning goal motivation have been seen to develop better relationships with their peers and supervisors [50,51].

One other aspect of rural clinical practice where a learning goal orientation is an advantage is in terms

of resilience [52]. An intrinsic learning motivation has been shown, in hospital environments, to enhance resident well-being and decrease burnout [53]. People with high levels of resilience recover quickly from setbacks, are able to apply their learning from their experience, and are better able to cope with life's challenges [54]. This is particularly important for doctors, and medical students, who are working in rural areas. Resilience allows rural health care professionals to better manage the challenges such as the high workload, emotional and physical demands and patient expectations [55,56].

The second aim of this study was an evaluation of the learning characteristics of the medical students at both medical schools. There is a strong belief that it takes a certain type of person to live and work in rural clinical practice [52]. Previous research has suggested that student attributes that are beneficial in a rural environment include a capacity to be self-motivated, independent and proactive with a willingness to think creatively [12,13,44]. Students from both cohorts had high scores for adaptability. Adaptability included factors such as creativity, experimenting, inventive and spontaneous. These factors would serve students well in rural placements where they need to understand how healthcare differs in an environment with different types of facilities and limited access to human and material resources [13,43]. In this study, the characteristics of curiosity and adaptability were seen to increase with age, in this way a graduate entry programme may be an advantage in preparing students to meet the challenges of rural placements.

As mentioned above, as members of the rural healthcare team, medical students on rural clinical placements are given additional responsibility in patient management and in terms of health leadership [45]. Students from both cohorts of medical students had high scores for consciousness. Consciousness is an important characteristic of rural clinicians where a sense of responsibility, social justice and social accountability is higher than is displayed in urban practitioners [4]. Consciousness as a learner characteristic was not seen to change with age. It has been suggested, that leadership skills, such as consciousness and integrity, are largely dependent upon individual experience of disadvantage and a strong sense of social justice [14].

The final part of this study demonstrated that students from both medical schools had a preference for deep approaches to learning. This corresponds to the learning goal motivation of students as a deep approach to learning occurs when students are intrinsically motivated to learn. Students with a deep approach to learning independently search for the meaning and application of what they are learning.

Historically, a deep approach to learning was associated with enhanced knowledge retention and greater understanding [57–59]. However, in a rural placement situation with reduced resource availability this approach to learning could also reduce student dependence on preceptors and facilitators to structure their learning as they will be able to motivate themselves based on their clinical placement experiences.

Limitations and strengths

One of the strengths of the current study is the complimentary purposes of the two medical schools involved. Both schools have a focus on producing medical graduates with a capacity and desire to work in regional, rural and remote clinical practice. This shared focus was an important aspect of this collaboration. However, it can be challenging interpreting data collected from two culturally different countries with students speaking different native languages. This challenge was mitigated by conducting a pilot study where the survey was administered to a different cohort of Norwegian medical students who reassured the research team that the Norwegian students would be able to complete the survey in English. In terms of interpretation of the results from different cultural perspectives, the research team consisted of academics from both countries who met regularly to discuss the implications for the results and the context of the findings through the lens of their individual circumstances.

As with any studies relying on self-reported data from students, it needs to be considered that the students may be trying to please the researchers and thus providing the responses the research team is expecting. However, one of the strengths of the study design is that the surveys were administered anonymously so there is no reason to expect that students were giving the desired answers. In addition, the responses for each question were varied suggesting that there was no consensus among the students about what the right or preferred answer was.

One of the limitations of the study is the response rate of 50% for the Norwegian cohort. While this could be of concern it is not unreasonably low for a survey administered online. Previously we have reported [28] a response rate for an online administered survey of approximately 40% compared to a response rate of over 85% for face to face administered surveys. The population who responded to the survey is representative of the Norwegian student cohort in terms of

gender and age, therefore the results are likely generalisable to the entire Norwegian cohort.

Conclusion

Graduating doctors with the desire and capabilities required to practice in rural areas is, in part, dependent on students having a positive experience during rural placement experiences in medical school. Selection of students with a learning goal orientation and learning characteristics of curiosity, adaptability and consciousness should set students up with the skills required to flourish in placement environments that may present resource challenges such as those encountered in regional, rural and remote areas or in settings where lower socioeconomic capital leads to healthcare worker shortages. Because of the challenges of health service delivery in these environments, these placements are demanding for medical students and as such requires students to be more self-motivated, adaptable and self-directed than students undertaking placement in metropolitan areas.

Acknowledgments

The authors acknowledge the contribution of Torsten Risør and Greg Peoples who facilitated data collection.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This project received no external funding.

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