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Geographically, rural U.S. communities have higher rates of disease and health problems, compared to urban areas. This encourages development of effective, learner-centred curricula to enable students to address disparate health outcomes as future health professionals. This three-year study evaluated the effect of an undergraduate rural public health course on health disparities-related perceptions among students at a rural Midwestern U.S. university. Students reported statistically significant increases in mean scores for several survey items pre- to post-survey. Post-survey response rate was 90%. This paper details the processes, outcomes, and lessons learned from incorporating learner-centred strategies to teach health disparities material in a rural public health course.

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Introduction

Health disparities are defined as differences in health status among population subgroups that are closely associated with social or economic disadvantage, and related to such factors as race or ethnicity, socioeconomic status, gender, religion and geography (US Department of Health and Human Services 2008). One in five persons, or roughly 60 million people, live in rural USA (US Census Bureau 2017). Generally, rural areas are sparsely populated, have low housing density and are far from urban centers (US Census Bureau 2017). Geographically, rural US communities have higher rates of morbidity and mortality and poorer health outcomes than urban areas (Barnridge et al. 2013; Befort, Nazir & Perri 2012; Meit et al. 2014). Rural US residents also experience greater rates of risky health behaviors, such as poor diet, physical inactivity and smoking, than urban residents (Hartley 2004; Eberhardt & Pamuk 2005; Matthews et al. 2017). These issues complicate a health-care workforce shortage in rural USA (Burrows, Suh & Hamann 2012), prompting recommendations for increased health-professional training to encourage students to pursue health-care careers within underserved communities (Burrows et al. 2012). While rural-urban health disparities are seen worldwide, including in countries like Australia and Canada (Phillips 2009; Pong et al. 2009), this paper will focus specifically on US rural health disparities.

Promoting awareness of health disparities among students of health professions can help cultivate a conscious health-care workforce to help reduce such disparities (Benabentos, Ray & Kumar 2014). While undergraduate public-health programs in the USA are increasing (Association of Schools and Programs of Public Health 2015), the incorporation of extensive health-disparities content into public-health courses is still evolving (Benabentos et al. 2014). Conversely, other health professions have developed curricula to encourage student interest in rural health practice (Critchley et al. 2007; Lilley et al. 1998; Stratton et al. 1991; Worley et al. 2000). In addition, there have been calls for additional research into the undergraduate experience of rural health education (Orpin & Gabriel 2005).

Learner-centred teaching in higher education encourages faculty members to focus on what students learn rather than what instructors teach; emphasises concepts of active learning, collaboration and emphasis on application; and motivates faculty members to help students relate knowledge and skills gained to their future professional and personal goals (Blumberg 2008; Felder & Brent 1999; Weimer 2013). Faculty members who practice learner-centred teaching emphasise problem-solving and critical thinking among students, serve as facilitators to guide student learning, encourage students to reflect on what and how they are learning, share power and give students choice and control in their learning and foster classroom community and collaboration among students (Weimer 2013). Learner-centred teaching also recognises the importance of cognitive strategies, such as reflective writing and self-assessments, to increase students' self-efficacy, empower them in their studies, foster deeper learning and promote greater academic achievement (Svinicki 2004; Young & Fry 2008). Learner-centred teaching strategies include incorporating web-based learning activities, using multiple forms of assessment to cater to different learning styles and involving students in decisions about course delivery; learner-centred assessment methods include structured case studies, formative summative assessments such as practice exams, cooperative learning and problem-solving sessions, peer-learning activities such as individual and group presentations, short answer tests, debates, paired discussions and inquiry-based learning (Wright 2011; Rich Jr et al. 2014).

Characteristics of learner-centered teachers include the ability to: stimulate intellectual curiosity, provide clear explanations and quality feedback, be enthusiastic about teaching and the subject

matter, use a variety of learning strategies, be respectful of students and share the ownership of knowledge (McCombs & Whisler 1997; Pintrich, Brown & Weinstein 1994; Murray & Renaud 1995; Henry 1994). Furthermore, learner-centred teaching strategies align with the constructivist theoretical approach to instruction, where learning is interactive and anchored in real-world contexts to make it purposeful and meaningful (Bonk & King 2012, p. 27). Therefore, our faculty incorporated learner-centred teaching strategies to educate students about rural health disparities they could address as future public-health professionals. This article describes the implementation of an undergraduate rural public health course taught by one faculty member and the effect of learner-centred teaching approaches on students' knowledge and attitudes about health disparities.

Methods

Setting and participants

This study took place at a rural, mid-sized, public university in the Midwestern USA. The university has eight colleges, including a College of Health Professions, and a student body of almost 13,000 undergraduate and graduate students, with many being first-generation tertiary students. Furthermore, the College of Health Professions is dedicated to training and educating future leaders in the health professions, and recently launched a Public Health program focused on preparing and educating students of health professions to work in underserved populations.

The study design was a pre- and post- survey given to a sample of 47 students in three sections of an undergraduate rural public health course taught during the years 2016 to 2018. The course met for a three-hour face-to-face lecture once a week in 2016 and 2018, and was taught fully online asynchronously via recorded lectures for eight weeks in 2017 to explore a distance-learning format. Enrollment in each section was capped at 20 students. This course is required for all Public Health majors in the university.

Faculty training and course development

A group of faculty members were assigned to develop courses for the new rural Public Health program launched in 2014. Faculty members participated in several professional-development programs at the university that helped stimulate ideas for learner-centred, inclusive teaching practices and pedagogical approaches about health disparities. During 2014 and 2015, faculty were also enrolled in the university's new faculty-transition program, and attended bimonthly workshops on such topics as "Active Learning", "Socratic Questioning", "Using Writing to Learn", "Elements of a Learner-Centred Syllabus", "Connecting Student Learning Outcomes" and "The Inclusive and Engaged University Community".

To prepare for online teaching, faculty members completed an eight-week online course, designed to provide online professional development for educators and exploration of online teaching and learning principles and competencies (MarylandOnline 2014). Faculty members learned effective online teaching strategies for student success, including reflection as an active learning strategy to develop cognitive presence online, consideration of cultural differences that effect online learners and procedural scaffolding as a cognitive strategy to support learners' thinking (Stavredes 2011). Faculty members also attended a week-long immersion workshop in which they planned and organised course development, mapped program curricula, established program assessment measures and implemented instructional design. Some faculty members participated in a Junior Faculty Fellows Program (JFFP), which helped faculty members in their second or third year at the university advance their teaching, scholarship or service goals within an accountable and supportive learning community. A faculty member who completed the JFFP chose to evaluate the effect of

curricula on students' awareness about health disparities, to serve as a final deliverable for the program. Therefore, the JFFP supported the faculty member's efforts to implement instructional approaches and gather data on student learning about rural health disparities.

Instructional delivery

Incorporating a variety of teaching styles and assessment methods, one faculty member made focused attempts to infuse awareness about health disparities into three sections of a rural public health course (Table 1). Course learning outcomes, lecture objectives and topics were designed to build awareness of the presence of, contributors to and consequences of health disparities within rural America (Crosby et al. 2012).

Table 1. Sample course learning outcomes, assessment methods, lecture topics and objectives for rural health course

Course Learning outcome	**Assessment method *** **(percentage of final grade for face-to-face and online class, respectively)*	**Sample lecture topic**	**Sample lecture objective**
1. Describe rural and non-rural populations.	Reaction paper (4%, 4%)	Depth of Rural Health Disparities	Recognise how demographics, chronic-disease prevalence and geography contribute to health disparities in rural communities.
2. Identify the health needs and concerns of rural populations.	Group presentation (20%, 20%)	Adolescent Health in Rural Communities	Understand the contextual factors that contribute to adolescent health behavior in rural communities.
3. Discuss the socio-behavioral determinants of health and healthcare disparities in rural populations.	Discussion-board posting (4%, 10%)	Farm Safety	Understand the significance of social, cultural and behavioral factors in preventing farm-related injuries.
4. Identify the various types of public health services available in rural populations.	Final paper (15%, 15%)	Core Functions and 10 Essential Services of Public Health	Understand the core functions of public health and how they relate to the 10 essential Public health services.

Course Learning outcome	**Assessment method *** **(percentage of final grade for face-to-face and online class, respectively)*	**Sample lecture topic**	**Sample lecture objective**
5. Analyse public-health partnership/coalition programs serving rural populations.	Small-group activity (4%, 10%)	Community-Based Participatory Research in Rural Areas	Describe the role of community-based participatory research in racial and ethnic approaches to community health and how community health advisors bridge between health-care systems and medically underserved rural populations to affect breast-cancer screening rates.

Instructional activities for the course were intentionally designed to engage students and promote learning. Student engagement has been described as "the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes" (Hu & Kuh 2002, p. 555). Student engagement depends on various related factors including the learner, instructor, subject matter, environment and teaching methods (Meo et al. 2013). A range of delivery methods can be incorporated, including PowerPoint presentations, chalkboards and whiteboards and online media (Hunt et al. 2016).

Guest lecturers were invited to class to reflect the cultural diversity of public-health practice and to teach students about topics related to rural health disparities. Topics explored included maternal and child health and mental-health disparities in rural areas, the effect of rural locations on individuals living with disabilities, leadership challenges in the delivery of rural health-care services and rural-urban differences in cancer screening. Guest lecturers were from within the Public Health program and other colleges and departments, such as Social Work and Retention and Student Success. The instructor also collaborated with the university's Dental Hygiene program and invited a Dental Hygiene student to deliver a lecture as part of a presentation on community dentistry.

Assignments

The rural-health course was designed to provide students with an overview of general concepts and principles related to public-health services in rural populations, and to delineate the determinants of access to health care and the health-care system in underserved rural populations. Various learner-centred, evidence-based teaching techniques were implemented in the face-to-face and online sections of the course. In the online section, a discussion-board assignment required students to view a documentary about barriers to oral health in underserved populations, answer reflective questions and reply to the discussion postings of at least two classmates. In another assignment for the online section, the instructor divided students into groups for a discussion-board assignment, assigned each group a textbook chapter to summarise for the class and required students to respond individually to at least two other groups' discussion posts. The face-to-face section also had an assignment to summarise chapter readings. To promote engagement and collaborative learning in the face-to-face section, student groups were asked to jot down key summaries on large easel pads

and then report a synopsis back to the class. Asking students to make a visual list on paper or on the blackboard and having them work in groups may generate more-comprehensive lists than if a student were working alone (Bonwell & Eison 1991).

During the face-to face delivery of the course, teaching modalities such as group discussion, peer instruction and use of multimedia on such topics as telehealth, mental-health disparities, farm safety and rural food insecurity were used to educate students about contemporary rural health issues. Small-group discussions were created by breaking students into groups to respond to questions on course concepts and then asking them to report back to the larger group. Such strategies can promote critical thinking and cater to different learning styles (Bonwell & Eison 1991). Class exercises also exposed students to initiatives conducted by federal agencies that aim to improve health-care access for uninsured, isolated or medically vulnerable populations (Health Resources & Services Administration 2018). Application activities given to students to reinforce course content included exercises to explore sample funding announcements and apply needs assessments to case studies. Overall, various interactive activities were incorporated to keep students engaged during the three-hour lecture.

In a learner-centred classroom, learners are empowered, active agents in their own learning, and they have the ability to make decisions and influence aspects of their learning, such as topics, means of demonstrating their knowledge or skills, deadlines and/or class policies (Weimer 2013). The instructor incorporated learner-centred teaching on the first day of the face-to-face class by allowing students to vote on the class format, and to decide between having a reduced break and finishing class earlier, or having a longer break and finishing class at the regularly scheduled time. In another example of power-sharing, students were given an assignment to present on a contemporary rural-health topic of their choosing and then respond to questions from their peers. For all sections, another assignment required students to review an international rural-health journal and evaluate a research article of their choice that focused on a health problem contributing to rural health disparities.

Another activity for the face-to-face section was to ask students to write down their "muddy points" – course concepts they were confused about – on index cards. The instructor then used these student questions to structure exam-review sessions. This is a simple assessment method that has high information return and low investment of time and energy (Angelo & Cross 1993). Moreover, the idea of playing games in a university setting may seem curious, but it can be a very effective instructional tool. In particular, some concepts or theories are more easily illustrated than discussed, and in these cases, a well-conceived game may convey the idea more readily (Bonwell & Eison 1991). The instructor incorporated Jeopardy!-type games in the face-to face section to serve as an exam review and to promote active learning and collaboration.

A summative assignment instructed students to design a public health service program for a health issue affecting a rural, underserved community. This assignment was in the form of a PowerPoint presentation, which was in narrated format for the online section. A narrated PowerPoint presentation is a flipped-classroom component that can enhance student performance (Della Rata 2015). Students in the face-to-face section were also assigned a group presentation project to develop a public health service program for a health issue affecting a rural, underserved community. Students were asked to self-select their groups. Before starting the group project, student teams were instructed to complete a team contract to promote enhancement of communication and teamwork skills (Svinicki 2004; Young & Fry 2008). In the online section, students were also instructed to complete a peer-review assignment where they had to evaluate at least three of their peers' presentations. Evaluation of another student's work is a particularly effective way to improve

student writing (Angelo & Cross 1993). Overall, participation in this course was an expectation and was graded. Participation activities, such as reflective papers and discussion boards, comprised 40% and 60% of the final grade in the face-to-face and online sections, respectively (Table 1). These intentional educational activities were designed to teach and reinforce concepts about the existence and impact of health disparities within rural American society.

Data collection

Upon receipt of Institutional Review Board approval from the university, students completed pre and post surveys to assess the effect of instructional approaches on their knowledge about and attitudes toward health disparities. Surveys were distributed at the beginning and end of the semester (at eight weeks apart for the online section, and 16 weeks apart for the face-to-face sections). The survey included eight questions to gauge level of agreement through a five-point Likert scale (1=strongly agree, 5=strongly disagree). Survey questions were developed based on course learning outcomes. The survey collected sociodemographic information on gender, age, year in school, area of residence, employment status and academic major. Students were also asked to complete online evaluations to rate instructor and course elements (IDEA 2019). Additionally, a department head or member of a tenure committee was present to observe a class session or was granted access to the online module, and evaluated the instructor in such areas as teaching style, student engagement, organisation and preparation.

Data analysis

Study data were coded and entered into the Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 24.0). Descriptive statistics, including frequencies and means, were generated to compare pre and postsurvey scores and analyse demographic characteristics. Data was normally distributed. Paired t-tests and one-way analysis of variance (ANOVA) were used to assess the change in students' responses to questions between the pre and post survey. Level of significance was set at $p<0.05$.

Results

Within the three course sections, 52 students completed the pre-survey (100% completion rate), while 47 students completed the follow-up survey. Follow-up survey completion rates by year were 100% (2016), 74% (2017) and 100% (2018). Table 2 summarises the statistics of students' sociodemographic characteristics. Students in this sample were primarily between the ages of 18 to 24 years, female, seniors in school, rural residents, Public Health academic majors and employed part-time. The questions used in the pre and post surveys had face validity and were shown to have internal reliability based on data analysis.

Table 2. Characteristics of students (n=47) from pre and post surveys

Variable	**N (%)**
Age	
18-24 years	41 (87.2)
25-44 years	4 (8.5)
45-64 years	2 (4.3)
Gender	
Male	13 (27.7)
Female	33 (70.2)
Other	1 (2.1)

Variable	**N (%)**
Year in school	
Sophomore student	4 (8.5)
Junior student	18 (38.3)
Senior student	25 (53.2)
Area of residence	
Urban area	13 (27.7)
Rural area	23 (48.9)
Suburban area	11 (23.4)
Employment status	
Employed full-time	15 (31.9)
Employed part-time	21 (44.7)
Unemployed	6 (12.8)
Seasonal or temporary worker	5 (10.6)
Academic major	
Public health	34 (72.3)
Nursing	4 (8.5)
Other	9 (19.1)
Year and semester	
Fall 2016 (face-to-face)	20 (42.5)
Spring 2017 (online)	14 (29.8)
Spring 2018 (face-to-face)	13 (27.7)
Delivery method	
Face-to-face	33 (70.2)
Online	14 (29.8)

Paired t-tests revealed statistically significant positive changes in students' pre and post survey scores for several survey items (Table 3). ANOVA analyses also yielded statistically significant differences in students' awareness of health disparities according to gender, age, area of residence, year in school, employment status, academic major and delivery method. At follow-up, women had statistically significant higher mean scores than men ($p=0.001<0.05$), and 25- to 44 year-old students had statistically significant higher mean scores than 18- to 24-year-old and 45- to 64-year-old students ($p=0.020<0.05$). Urban residents had statistically significant higher mean scores from baseline to follow-up survey than rural and suburban residents ($p=0.001<0.05$), senior students higher than sophomore and junior students ($p= 0.003<0.05$), students employed part-time, higher than those employed full-time, unemployed, or seasonally ($p=0.000<0.05$.) and students in face-to-face sections higher than online students ($p=0.001<0.05$).

Table 3. Paired sample t-test mean scores for students' pre and post surveys (n=47)

Survey question	Mean baseline survey score (1=low, 5=high)	Mean follow-up survey score (1=low, 5=high)	Significance (two-tailed) *P*-value
1. I have an interest in health promotion and education.	4.44	4.53	.568
2. I have discussions with others about topics related to health promotion and education.	3.90	4.40	**.002***
3. I understand what the term "health disparities" means.	4.00	4.65	**.000***
4. I am able to explain the relevance of health disparities to planning, implementing and evaluating a health-promotion program.	3.60	4.43	**.000***
5. I am able to discuss strategies health-promotion programs can use to reduce health disparities.	3.56	4.54	**.000***
6. I am able to discuss the role of theory in understanding health behavior and disparities in health status.	3.40	4.26	**.000***
7. I am able to examine the role of collaboration and advocacy in developing effective public-health interventions.	3.56	4.55	**.000***
8. I would like to explore issues related to health disparities in my education, research or practice.	4.35	4.60	.069

*Statistically significant ($p<0.05$)

Course evaluations and student reflections

The instructor observed that various teaching modalities encouraged learning, increased participation and promoted engagement among students. Online course evaluations in the three sections averaged an 88% completion rate. On the evaluations, students' summary assessment of teaching effectiveness averaged an overall course rating of 4.5 out of a 5.0 scale. Students also gave ratings (out of a 5.0 scale) within the course evaluations on various items of instructor assessment for the rural public health course (Table 4).

Table 4. Select student ratings on course evaluations

	Course year		
Item	**2016**	**2017 (Online)**	**2018**
Related course material to real life situations	4.65	4.53	4.77
Found ways to help students answer their own questions	4.29	4.33	4.23
Encouraged students to use multiple resources to improve understanding	4.29	4.33	4.54
Encouraged students to reflect on and evaluate what they have learned	4.53	4.47	4.69
Involved students in hands-on projects such as research, case studies, or real life activities	4.41	4.33	4.54
Created opportunities for students to apply course content outside the classroom	4.24	4.33	4.46
Formed teams or groups to facilitate learning	4.71	4.0	4.69
Asked students to help each other understand ideas or concepts	4.29	4.4	4.69
Learning to apply course material (to improve thinking, problem solving, and decisions)	4.18	4.2	4.38

Moreover, students provided quantitative and qualitative responses in the course evaluations, referring to teaching styles used and course content on health disparities. One qualitative response to the course was:

> *I really enjoyed this class and thought that it really made me more aware of the disparities in rural areas. I thought [instructor] did a great job teaching it, I love that [instructor] incorporate[d] so many different things and not just lectures, it really makes the class a lot better.*

One student stated, "I found it an excellent course in preparing for situations in rural Public Health." Another student expressed appreciation for "a variety of activities and teaching methods to make class more interesting". Students also suggested ways to improve the rural public health class. One student wrote, "Perhaps more case study type lessons could help to give more variety to the class". Another student suggested, "The classroom setup would be better if it was organized to facilitate discussion among the class better." Students also gave course feedback through reflective assignments, which demonstrated thoughtful self-examination related to health-disparities-related course content and insights gained from the course (Table 5).

Table 5. Excerpts from students' reflective assignments

Student	**Reflection**
Student A	"The three most important concepts I have learned in this course are community capacity, rural health professional shortages, and the prevalence of rural American disparities. Going into this course, I was under the impression that a global approach would be taken. I was surprised and enlightened when I learned about the very prevalent health disparities present right here in rural America."

Student	Reflection
Student B	"There are many important concepts and items I learned in this course. Growing up in an urban area I didn't know about many of the challenges individuals living in rural areas dealt with on a daily basis. Firstly, the most important concept I learned is that there are many disparities in rural healthcare.... I did not realize how difficult some individuals have it just based on where they live. Secondly, I learned that being isolated in a rural area has a huge impact on health…. Lastly, I learned that there is a huge stigma to receiving mental healthcare in a rural area."
Student C	"Before this course, I had no idea of what rural meant or what people went through living in a rural community. This course helped me become aware of the challenges that people face living in a rural community and how vulnerable they are…. Another thing that I liked about this course was reading through interventions that were used to help rural populations. One that stuck out the most to me was the treatment of depression within a rural African-American faith community. This helped me learn more on Public Health and how professionals could be able to help these vulnerable populations."
Student D	"One important concept I learned in this course is the awareness of health disparities in rural areas. Another important concept I learned is the importance of collaboration and multidisciplinary approaches in rural health. One thing that will definitely stick with me is the use of community members as leaders in rural areas. Lastly, one thing I have learned is the different data surveillance services and the differences between them."
Student E	"In this course I learned about the many influences that affect the health care in rural areas and how those who live in rural areas are affected by it…. With what I learned about research done in the field and sources I can use, I can apply that to my future studies and career. I am even considering using a government program to work in underserved/rural areas. This class also has me looking at communities differently, looking at how different departments influence public health. I also have been thinking more about mental health and how in our own community there is a huge lack of care and possible ways policies can be changed to help people…."
Student F	"Understanding rural health disparities and challenges in public health is probably the most important concept. Strategies for building coalitions and capacity building is an important concept I picked up during this course that will be useful in building a health network. Public health campaigns in rural areas are an opportunity to make significant improvements in health with prevention once cultural adjustments are negotiated within the framework."

Furthermore, feedback from teaching observations was positive. Comments provided an opportunity to discuss feedback with the department head and members of tenure committees.

Discussion

Various teaching modes and activities were used to promote learning, engagement and awareness of rural health disparities among students in this sample. Assessment activities were designed to align with course learning outcomes. Course goals were connected to the ultimate aim of increasing motivation for learning among students. This is essential because efforts to enhance curriculum

development and delivery can help meet program goals of equipping students to address the needs of underserved populations (Njoku 2017). Overall, faculty members strove to deliver learner-centred education to better equip students to deal with the needs and challenges in rural areas as imminent public health professionals. Faculty members theorised that principles of learner-centred teaching, such as empowering students in the classroom to shape their learning experiences (Weimer 2013), would have important implications for their futures as rural health professionals, help them achieve required learning outcomes and illustrate the benefits and value of power-sharing. Consequently, students would be encouraged to be more proactive about building collaborations and partnerships once entering the field, which is especially important in rural contexts (Barnridge et al. 2013).

The increase in mean scores for each survey item from pre to post survey was significant, and suggested that course content promoted students' health-disparities-related awareness and intention. Intentionally designing a program to prepare students in health professions for rural health practice has been linked to significantly higher rates of rural practice and retention (Florence et al. 2007; MacDowell et al. 2014). Health-disparities courses can allow students to contextualise current societal issues that affect rural health, and it is important to measure the effect of such courses on students' motivation and career choices (Coyle & Narsavage 2012). Geographically, there was an increase in mean scores at follow-up among urban, suburban and rural residents. Students' rural background has been associated with successful undergraduate interventions to promote rural health (Hsueh, Wilkinson & Bills 2004). Study results also showed a statistically significant increase in scores among women, 25- to 44-year old students, students employed part-time and senior students. This somewhat mirrors a study which indicated that first- and final-year health-science students had some career commitment to rural practice (Orpin & Gabriel 2005). Conversely, studies have shown that males are more likely than females to work in rural areas (Laven et al. 2003; Wilkinson et al. 2003). Moreover, the increases in mean scores for students' interest in health promotion and education and desire to explore issues related to health disparities in their education, research or practice were not statistically significant in this study. This suggests an opportunity to present viable opportunities to students to promote interest in rural health careers. Family, personal factors, availability of employment and rural health clinical affiliation have been found to be major influences in determining the decision to choose a career in a rural location among students in health professions (Florence et al. 2017; LaPorta, McWhorter & Naas 2002).

Course evaluations showed alignment with student's learning abilities and receptiveness to learning about rural health disparities. Furthermore, IDEA score averages in all three sections were positive and illustrated effectiveness at employing instructional strategies and achieving course objectives and learning outcomes. Higher ratings signify greater student progress and more-positive student experience (IDEA 2019). Students' reaction papers and end-of-course reflective exercises revealed new insights gained from the course. Reflective assignments have been shown to affect students' self-awareness and encourage their questioning regarding pre-conceived notions (Isaac et al. 2015). Moreover, a learner-centred approach to teaching encourages students to take an active and reflective role in their own learning (Weimer 2013). This task may make students more conscious of and empathetic to the challenges of engaging rural residents as active contributors in their own health care. Such challenges can also promote critical thinking and problem-solving skills in the classroom, which can empower students to take ownership of their own learning, better enable them to problem-solve in the field and allow them to help create healthier and more equitable communities in rural areas.

The learner-centred approach appears to be particularly relevant in the training of Public Health undergraduates, as education in public health is a collective effort, sometimes referred to as a "team

sport" (Lee & Friedman 2015), and therefore the training institutions' responsibility to prepare graduates to be successful during practice of their discipline. These findings are important because undergraduate public-health students are preparing for entry-level careers or are on the path towards advanced training (Lee & Friedman 2015).

Faculty-development programs were influential in motivating and supporting a faculty member's efforts to use intentional teaching strategies and collect data on student learning about health disparities. Faculty-development programs have been shown to enhance knowledge, attitudes and skills, and to increase inspiration and motivation for teaching among faculty members (Lancaster et al. 2014). Opportunities to improve faculty teaching can motivate faculty members to stimulate active learning, critical thinking, problem-solving and collaboration among students (Weimer 2013).

This study had some limitations. First, we had a small sample size, as enrollment in each section of this course was capped at 20 students. Therefore, results may not be generalisable to larger populations. The study can be repeated on a different and larger sample to determine if instructional strategies achieve similar effects. Second, selection bias may be an issue because this course is required for undergraduate Public Health majors at the university. Students may have been more interested in taking this course as a result. Lastly, this assessment found meaningful changes in students' attitudes about health disparities when measured before and after the course, although an assessment of longer-term outcomes is needed to fully investigate the course's impact on students.

Nonetheless, the statistically significant changes in students' health-disparities-related perceptions suggest a positive effect on knowledge and attitudes among students in health professions. The survey yielded a high response rate, and student feedback regarding the course experience was informative. Although findings are from one public-health program at a rural Midwestern university in the USA, they may offer some interesting insights and suggest the need for additional research.

Future directions and implications for practice

Our Public Health program should consider incorporating academic service learning and community-based participatory research to promote student engagement in the rural community, provide reflection opportunities on contextual factors affecting rural health, help students apply course concepts to real-world settings and enhance students' cultural competence (McElfish et al. 2015; Sabo et al. 2015; Strasser 2016). While public-health students in our program are required to complete a culminating internship to integrate classroom education with a practical learning experience, and often select rurally located agencies, we can consider introducing such experiences earlier in the curriculum. We should also continue to consider collaborative efforts with other health-profession disciplines, such as nursing, dental hygiene, pharmacy and optometry, as well as non-health disciplines, such as education and social work, to disseminate resources and develop curricula related to rural health disparities and collective projects, to assemble a wider set of future stakeholders committed to eliminating health disparities (Benabentos et al. 2014).

Instructors should also assess the effect of teaching the rural health course on their personal and professional development, and apply lessons learned to future instances of the course. While this paper focuses on one faculty member's application of development programs to enhance teaching of, and students' learning about, rural health disparities, future efforts should examine the experiences of more faculty members within the program.

Furthermore, disparities in healthcare outcomes are a major public health concern (US Department of Health and Human Services 2008). Effective educational interventions are needed to increase the proportion of health professionals working in rural and other underserved areas (Grobler et al. 2009). Health disparities courses can allow students to contextualise current societal issues that affect health, and may promote student interest in rural health careers (Coyle & Narsavage 2012).

Conclusion

In summary, promoting students' awareness of health disparities is important to addressing rural health disparities. Undergraduate institutions can play an important role in stimulating students' awareness and understanding of these disparities. Moreover, incorporating learner-centred strategies in course development and delivery can help improve program goals of enabling future health professionals to address the needs of underserved populations. Empowering students may make them more invested in their future careers and, in turn, the communities in which they work. The learner-centred approach appears to be particularly relevant in the training of public-health undergraduates to succeed in the practice of their discipline. Ultimately, this will help enhance public-health practice.

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