

Q method in research on health professions education and digital technologies: a systematic review

Método Q nas pesquisas em educação das profissões de saúde e tecnologias digitais: uma revisão sistemática

Método Q en la investigación sobre la educación de las profesiones de salud y las tecnologías digitales: una revisión sistemática

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Samára dos Santos Sampaio

ORCID: <https://orcid.org/0000-0002-2441-1934>
University of São Paulo, Brazil
E-mail: sami_sampaio@hotmail.com

Janise Braga Barros Ferreira

ORCID: <https://orcid.org/0000-0001-7480-937X>
University of São Paulo, Brazil
E-mail: janise@fmrp.usp.br

Nayara Ragi Baldoni

ORCID: <https://orcid.org/0000-0002-3400-0725>
Federal University of São João del-Rei, Brazil
E-mail: nrbaldoni@gmail.com

Josiane Maria Donadeli

ORCID: <https://orcid.org/0000-0002-1024-2762>
Federal University of São Carlos, Brazil
E-mail: josianedonadeli@gmail.com

Maria Neyrian de Fatima Fernandes

ORCID: <https://orcid.org/0000-0001-7626-9733>
Federal University of Maranhão, Brazil
E-mail: neyrian.maria@ufma.br

Márcia dos Santos

ORCID: <https://orcid.org/0000-0002-6830-6693>
University of São Paulo, Brazil
E-mail: marciasantos@usp.br

Maria Cristiane Barbosa Galvão

ORCID: <https://orcid.org/0000-0003-3971-5743>
University of São Paulo, Brazil
E-mail: mgalvao@usp.br

Juan Stuardo Yazlle Rocha

ORCID: <https://orcid.org/0000-0002-7131-4950>
University of São Paulo, Brazil
E-mail: juan.yazlle@gmail.com

Ana María Palmar Santos

ORCID: <https://orcid.org/0000-0003-2294-390X>
Universidad Autónoma de Madrid, Spain
E-mail: ana.palmar@uam.com

Aldaísa Cassanho Forster

ORCID: <https://orcid.org/0000-0002-2720-5802>
University of São Paulo, Brazil
E-mail: acforste@fmrp.usp.br

Abstract

Q method, a mixed methods research approach, is used to explore points of view and attitudes towards a specific phenomenon from subjective human perspectives. There has been an increase in the use of digital technologies in education and it has become necessary to investigate the difficulties and facilities of health professionals and students in order to improve the use of such technologies for teaching and learning. We aimed to identify and evaluate studies that employed Q method to investigate the use of digital technologies in Health Professions Education. To achieve this, a systematic review was conducted according to the PRISMA Statement Guidelines. The selection of articles was based on the search strategy ("Q-sort" OR "Q-methodology" OR "Q-technique") AND ("Teaching") OR ("Learning"). Of the 1,398 articles found, 13 were selected in accordance with the adopted inclusion criteria. The

articles successfully applied Q method to health issues, which expands its application possibilities and provides a contribution to mixed methods research. Another contribution is the use of the Mixed Methods Appraisal Tool in this type of review. In view of the pressing need for education changes, using mixed methods research, particularly Q method, to investigate teaching culture and practice, can successfully support the renewal of Health Professions Education.

Keywords: Q sort; Health professions education; Learning; Teaching; Digital technologies.

Resumo

O método Q, uma abordagem de pesquisa em métodos mistos, é usado para explorar pontos de vista e atitudes em relação a um fenômeno específico para compreender elementos constituintes da subjetividade. Tem havido um aumento no uso de tecnologias digitais na educação e torna-se necessário investigar as dificuldades e facilidades dos profissionais de saúde e estudantes para aprimorar o uso dessas tecnologias no ensino e na aprendizagem. O objetivo foi identificar e avaliar estudos que utilizaram o método Q para investigar o uso de tecnologias digitais na educação das Profissões de saúde. Para isso, uma revisão sistemática foi conduzida de acordo com as Diretrizes da Declaração PRISMA. A seleção dos artigos baseou-se na estratégia de busca (("Q-sort" OR "Q-methodology" OR "Q-technique")) AND (("Teaching") OR ("Learning")). Dos 1.398 artigos encontrados, 13 foram selecionados de acordo com os critérios de inclusão adotados. Os artigos aplicaram com sucesso o método Q nas questões de saúde, o que amplia suas possibilidades de aplicação e fornece uma contribuição para a pesquisa de métodos mistos. Outra contribuição é a utilização da Ferramenta de Avaliação de Métodos Mistos neste tipo de revisão. Tendo em vista a necessidade premente de mudanças na educação, o uso de métodos mistos de pesquisa, particularmente o método Q, para investigar a cultura e a prática do ensino, pode apoiar com sucesso a renovação da Educação das Profissões de Saúde.

Palavras-chave: Q sort; Educação das profissões de saúde; Aprendizagem; Ensino; Tecnologias digitais.

Resumen

El método Q, un enfoque de investigación de métodos mixtos, se utiliza para explorar puntos de vista y actitudes hacia un fenómeno específico desde perspectivas humanas subjetivas. Ha habido un aumento en el uso de las tecnologías digitales en la educación y se ha hecho necesario para investigar las dificultades y facilidades de profesionales de la salud y estudiantes con el fin de mejorar el uso de estas tecnologías para la enseñanza y el aprendizaje. El objetivo fue identificar y evaluar estudios que emplearon el método Q para investigar el uso de tecnologías digitales en la Educación de las Profesiones de la Salud. Para lograr esto, se realizó una revisión sistemática de acuerdo con las Directrices de declaración PRISMA. La selección de artículos se basó en la estrategia de búsqueda (("Q-sort" OR "Q-methodology" OR "Q-technique")) AND (("Teaching") OR ("Learning")). De los 1.398 artículos encontrados, 13 fueron seleccionados de acuerdo con los criterios de inclusión adoptados. Los artículos aplicaron con éxito el método Q a problemas de salud, lo que amplía sus posibilidades de aplicación y proporciona una contribución a la investigación de métodos mixtos. Otra contribución es el uso de la herramienta de evaluación de métodos mixtos en este tipo de revisión. En vista de la urgente necesidad de cambios en la educación, el uso de la investigación de métodos mixtos, en particular el método Q, para investigar la cultura y la práctica de la enseñanza, puede apoyar con éxito la renovación de la educación en las profesiones de la salud.

Palabras clave: Q sort; Educación de las profesiones de salud; Aprendizaje; Enseñanza; Tecnologías digitales.

1. Introduction

Q methodology, referred to in this study as Q method, was created in the 1930s by William Stephenson, an English physicist and psychologist who was interested in finding a scientific way to study subjectivity (Stephenson, 1935; Watts & Stenner, 2012). It is currently considered an important method to understand the meanings lent to a set of arrangements of statements distributed among a group of participants. Based on non-positivistic philosophical and epistemological premises, it correlates response arrangements and uses by-person factor analysis to identify groups of participants who think similarly (Dune, Mengesha, Buscemi, & Perz, 2019; Novaes, 2016, 2020; Watts & Stenner, 2012).

Explaining it in a summarized way, in Q method, participants rank a set of statements about a topic in a quasi-normal distribution according to their opinions, from 'least agree' to 'most agree' (for example, from - 4 or - 5 to + 4 or + 5). Then, factor analysis is performed from the individual points of view (or classifications) (Qurtas & Shabila, 2020; Yau, Babovič, Liu, Gugel & Monrouxe, 2021).

Any study employing this method follows five steps: definition of the concourse (statements about a specific theme),

development of the Q sample (or Q set, a subset of statements drawn from the concourse), selection of the P set (the subjects participating in the study), Q sort (arrangement of the Q sample by study participants in a rank) and, eventually, analysis and interpretation (Brown, 1980, 1993, 2009; Couto, Farate, Ramos & Fleming, 2011; Danielson, 2009a, 2009b; Webler, Danielson & Tuler, 2009). Some studies consider concourse construction, Q sample development, and P set selection as a single step, that is, the step of instruments development (Brewer-Deluce, Sharma, Akhtar-Danesh, Jackson, & Wainman, 2019).

Q method is exploratory and many authors have recently proposed that it can be understood as mixed methods research (MMR), as it enables the conciliation of qualitative and quantitative components in the same study (Akhtar-Danesh, Baxter, Valaitis, Stanyon, & Sproul, 2009; Dune et al., 2019; Ramlo, 2016; Stenner & Stainton-Rogers, 2004; Watts & Stenner, 2012). Furthermore, Q method has been used in different fields of knowledge, like psychology, social sciences and health (Cross, 2005; Eden, Donaldson & Walker, 2005; Watts & Stenner, 2012).

Exploring scientific evidence of the use of Q method in the health area, we found studies on the relative value of life extensions for people with terminal diseases from the perspective of the general population in the United Kingdom (Mason et al., 2018; McHugh et al., 2015); essential care aspects at the end of life in the opinion of people with dementia and their caregivers (Hill et al. 2017); views of young people with chronic conditions on transition from pediatric to adult care (Hislop, Mason, Parr, Vale & Colver, 2016); and literature reviews on the advantages and disadvantages of using this methodology (Dziopa & Ahern, 2001; Simons, 2013).

Cross (2005) states that Q method is a robust technique to explore individuals' beliefs and experiences in health education and health promotion research. In the field of Health Professions Education, there are examples of studies that employ this method in nursing education (e.g., Ha (2015), Lim, Wynaden, Baughman & Heslop (2021), Petit dit Dariel, Wharrad & Windle (2013)). According to Ha (2015), Q method is a crucial tool to identify, assess and reflect on nursing students' experiences and attitudes towards clinical practice, providing a useful insight to facilitate the development of effective clinical teaching strategies in nursing education.

In addition, the current diversity of university students - digital natives (individuals who have grown up in the digital age) and digital immigrants (individuals who have grown up before or partially before the digital age) - has led to an increasing use of technologies in health education. The evolution of web 3.0 has changed the forms of communication, increasing network collaboration skills, allowing self-guided and individualized learning for students, and enabling teachers to engage in short, succinct, fast, and frequent interactions with students (Chicca & Shellenbarger, 2018; Hays, 2018; Rocha & Sampaio, 2020; Sampson & Karagiannidis, 2002).

Conducted for methodological purposes (Munn, Stern, Aromataris, Lockwood & Jordan, 2018; Vidal & Fukushima, 2021), our study aimed to carry out a systematic review in order to identify and evaluate studies that employed Q method to investigate the use of digital technologies in Health Professions Education.

2. Methods

2.1 Study design

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009). It is also in line with the recommendations of the Cochrane Handbook for systematic reviews. The study followed the Studies, Data, Methods and Outcomes structure (SDMO) (Clarke, Oxman, Paulsen, Higgins & Green, 2011), seeking to clarify the impact of the methodology on the quality of the research within the specific field (Munn et al., 2018).

2.2 Search strategies

We used the SDMO structure (Clarke et al., 2011) to construct the research question: S: experiences in Health Professions Education; D: scientific articles; M: Q method; and O: use of digital technologies. Thus, the question directing the review was: “How has the Q method been used in research on the use of digital technologies in health education?”

2.3 Identification of Studies

Our search for published articles was carried out in six databases: PubMed, Scopus, CINAHL, PsycInfo, Web of Science, and Latin American and Caribbean Center on Health Sciences Information (LILACS). For the search strategy, we used the following descriptors combined with Boolean operators: "Q-sort" OR "Q-methodology" OR "Q-technique" AND learning OR teaching in five databases. Specifically in LILACS, "Q-sort" OR "Q-methodology" OR "Q-technique" OR "Metodologia Q" were used, as detailed in Box 1. We had the technical support of a librarian (M.S.) to design the strategy and to perform the article search.

Box 1 - Search Strategies

Database	Search strategy	Number of publications
PubMed	((“Q-sort” OR “Q-methodology” OR “Q-technique”)) AND (“Teaching”) OR (“Learning”))	93
CINAHL	((“Q-sort” OR “Q-methodology” OR “Q-technique”)) AND (“Teaching”) OR (“Learning”))	93
Scopus	((“Q-sort” OR “Q-methodology” OR “Q-technique”)) AND (“Teaching”) OR (“Learning”))	255
PsycInfo	((“Q-sort” OR “Q-methodology” OR “Q-technique”)) AND (“Teaching”) OR (“Learning”))	641
Web of Science	((“Q-sort” OR “Q-methodology” OR “Q-technique”)) AND (“Teaching”) OR (“Learning”))	297
Latin American and Caribbean Center on Health Sciences Information (LILACS)	((“Q-sort” OR “Q-methodology” OR “Q-technique” OR “Metodologia Q”))	19

Source: Authors.

2.4 Study Selection Criteria

The articles found in the search were transferred to the Rayyan QCRI software (Ouzzani Hammady, H., Fedorowicz, Z., & Elmagarmid, et al., 2016). Two researchers eliminated duplications and read titles and abstracts independently (S.S.S. and N.R.B.). Subsequently, they read the full-text articles that met the inclusion criteria. Any discrepancies between the reviewers' assessment in the phase of full-text reading and in the selection of the articles that would be included were solved by consensus and the mediation of another researcher (M.N.F.F.). The researchers excluded articles that merely assessed Q method instead of applying it to Health Professions Education with digital technologies.

Articles that described Health Professions Education using digital technologies and employed the Q method in their research, published up to December 2019, in Portuguese, English, or Spanish, were considered eligible.

2.5 Quality Assessment

Different research categories have been employing MMR (Creswell & Clark, 2010; Galvao, Pluye & Ricarte, 2017). For this, Q method was classified into the MMR category of exploratory sequential study. In studies in this category, a

qualitative (QUAL) step is followed by a quantitative (QUAN) step, that is, quantitative results are mobilized to confirm qualitative results, enabling a better understanding of the phenomenon. The expression QUAL>QUAN represents this MMR category.

Since Q method is considered to be MMR (Akhtar-Danesh et al., 2009; Dune et al., 2019; Ramlo, 2016; Stenner & Stainton-Rogers, 2004), the methodological quality of the included studies was evaluated through the Mixed Methods Appraisal Tool (MMAT version 2011) by two independent reviewers (S.S.S. and J.M.D.).

MMAT is used to analyze whether the sources of qualitative (QUAL) data are relevant, whether the appropriate resources were employed for quantitative (QUAN) studies, such as measurements (clear origin, validity known, standard instrument), and whether the integration of qualitative and quantitative data (MMR) answers the research question (Pluye et al., 2011).

We decided to use MMAT to detail the studies included in this review. The use of MMAT enabled to create a global quality score of each article, considering it as the lowest score of the study components. The score is 25% when QUAL=1 or QUAN=1 or MMR=0; 50% when QUAL=2 or QUAN=2 or MMR=1; 75% when QUAL=3 or QUAN=3 or MMR=2; and 100% when QUAL=4 and QUAN=4 and MMR=3 (Box 2).

Box 2 - MMAT¹ quality assessment for mixed methods studies according to the criteria²

Criteria	QUAL Domain	QUAN Domain	Mixed Domain
1	Are the sources of qualitative data (archives, documents, informants, observations) relevant to address the research question (objective)?	Is the sampling strategy relevant to address the quantitative research question (quantitative aspect of the mixed methods question)?	Is the mixed methods research design relevant to address the qualitative and quantitative research questions (or objectives), or the qualitative and quantitative aspects of the mixed methods question (or objective)?
2	Is the process for analyzing qualitative data relevant to address the research question (objective)?	Is the sample representative of the population understudy?	Is the integration of qualitative and quantitative data (or results) relevant to address the research question (objective)?
3	Is appropriate consideration given to how findings relate to the context, e.g., the setting, in which the data were collected?	Are measurements appropriate (clear origin, or validity known, or standard instrument)?	Is appropriate consideration given to the limitations associated with this integration, e.g., the divergence of qualitative and quantitative data (or results) in a triangulation design?
4	Is appropriate consideration given to how findings relate to researchers' influence, e.g., through their interactions with participants?	Is there an acceptable response rate (60% or above)?	

¹Acronyms: MMAT, Mixed Methods Appraisal Tool; ²Each domain is formed by 4 criteria, which were assessed as: 1, criterion met; 0, criterion not met or unable to determine. Source: Pluye et al. (2011).

2.6 Data Extraction and Synthesis

Data extraction was carried out by two researchers (S.S.S and N.R.B.). The eligible texts were read and summarized, observing aspects of authorship, year of publication, location, participants' characteristics, journal's area of knowledge, the digital technologies that were used, the main findings related to Health Professions Education, and particular aspects of Q method. The relevant information about each study was extracted and included in a spreadsheet made in Microsoft Word. Afterwards, this information was summarized.

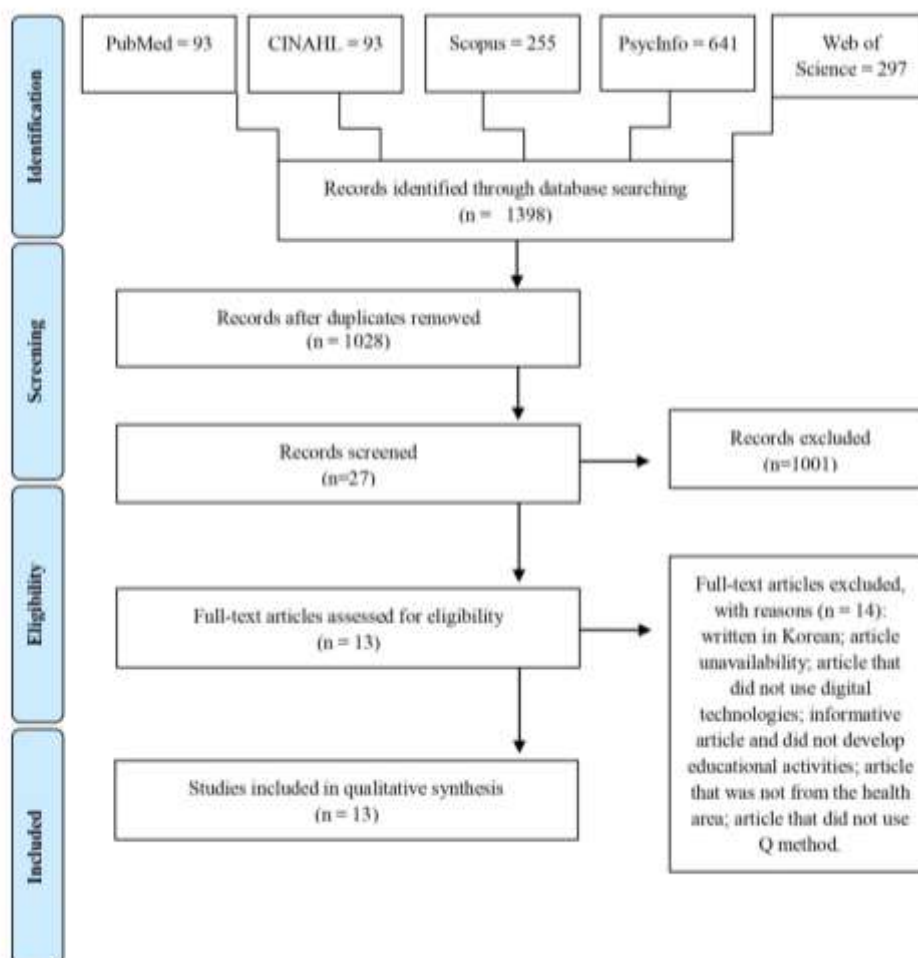
Because this study contains qualitative and quantitative data, meta-summarization was adopted to present the results and discussion. Meta-summarization is a type of meta-synthesis in which one describes qualitative findings in the quantitative form of statistics. Using topics, we pointed to data frequency and their prevalence, in order to validate them. In addition to extraction, we performed the abstraction of findings and calculated the amplitude of prevalence (Sandelowski & Barroso, 2003).

3. Results

Overall, 1,398 articles were identified, of which 370 were duplicated. After reading titles and abstracts, the researchers (S.S.S and N.R.B.) selected 44 articles, 12 articles in common. After reaching a consensus, the researchers selected 27 articles to be read in full. The application of the inclusion criteria resulted in 13 articles that made up the final sample of this study. The diagram of the selection of the articles that compose this systematic review can be found in Figure 1.

The reasons for the exclusion of 14 articles were: article written in Korean (n=2); article unavailability after additional searches in other databases and contact with authors (n=2); the study did not use digital technologies (n=4); the article was informative and did not develop educational activities (n=3); the study was not from the health area (n=2); the study did not use Q method (n=1).

Figure 1 - PRISMA Flowchart of the Selection of Reviewed Articles.



Source: Authors.

Table 1 presents a summary of the main aspects that were found, organized according to authorship and year of publication, place, sample characteristics, the type of technology that was used, the particular aspects of Q method in relation to how the qualitative and quantitative phases were carried out, and the main findings of the included articles.

Studies published from 1998 to 2018 were found and, to facilitate identification, they were arranged in chronological order. We observed that there was a predominance of studies conducted in the following countries: Canada (30.8%; n=4) and USA (30.8%; n=4), followed by Korea (23%; n=3) and United Kingdom (15.4%; n =2) (Table 1).

The selected studies were all written in English. Most of them (76.9%; n=10) were published in journals from the nursing area, followed by medicine (7.7%; n=1), physiology (7.7%; n=1) and psychology (7.7%; n=1). The number of participants varied in each researched study; the mean was 37. Concerning digital technologies in Health Professions Education, simulation was the most frequent (69.2%; n=9), followed by e-learning (23.1%; n=3), and videos (7.7%; n=1).

In the assessment of methodological quality, 11 studies can be considered as having high methodological quality (score 75% or 100% - MMAT), whereas two can be considered of lower methodological quality (score 50% - MMAT). The global quality score of the 13 studies is presented in Table 2.

Table 1 - Characteristics of the Included Studies (n=13).

1st Author, Year	Place	Participants	Used Technology	Qualitative Step	Quantitative Step	Key Results	MMAT Quality Score*
Miller et al., 1998	USA	45 Nursing undergraduate students	Simulation	29 statements; Interview	Extraction Method: Not declared; Rotation Method: Varimax	It identified three response arrangements: "non-judgmental professionalism", "competence/trust" and "empathy/respect" were the predominant styles exhibited during simulation featuring a patient with hypertension.	75%
Coogan et al., 2006	United Kingdom	102 Psychology students	e-learning	35 statements; Focus group and previous studies	Extraction Method: Centroid; Rotation Method: Varimax	It resulted in a main response arrangement and five other small arrangements that described the different approaches students have to using WebCT.	75%
Valaitis et al., 2007	Canada	14 medical residents in Anesthesiology; 11 Nursing undergraduate students; 9 Health Science professors; 2 employees of Health Science College	e-learning	42 statements; Questionnaire and Expert Evaluation	Extraction Method: Centroid; Rotation Method: Varimax and manual	It identified three points of view (response arrangement or factor): pragmatists (factor 1), positive communicators (factor 2A) and shy enthusiasts (factor 2B). These factors explained 28% (factor 1) and 11% (factor 2) of total variance, respectively.	75%
Akhtar-Danesh et al., 2009	Canada	28 Nursing professors	Simulation	43 statements; Focus group	Extraction Method: Centroid; Rotation Method: Varimax	It identified four points of view: (a) Positive enthusiasts, (b) Traditionalists, (c) Help seekers and (d) Supporters.	75%
Baxter et al., 2009	Canada	24 Nursing students	Simulation	49 statements; Literature review and questionnaires	Extraction Method: Centroid and Principal Component Analysis (PCA); Rotation Method: Varimax and manual	It identified that all the students think that simulated experiences might support learning in general, but there are four groups with different points of view: Reflectors, Reality Skeptics, Comfort Seekers, and Technology Savvies.	50%

Table 1 - Characteristics of the Included Studies (n=13).

1st Author, Year	Place	Participants	Used Technology	Qualitative Step	Quantitative Step	Key Results	MMAT Quality Score*
Petit dit Dariel et al., 2013	United Kingdom	38 Nursing professors	e-learning	53 statements; Literature review and interview	Extraction Method: Centroid; Rotation Method: Varimax and manual	Four points of view were identified: “E-learning advocates”, “Humanists”, “Sceptics”, and “Pragmatics”.	75%
Yeun et al., 2014	Korea	22 Nursing undergraduate students	Simulation	45 statements; Literature review and interview	Extraction Method: PCA; Rotation Method: Varimax	Results revealed two different student groups in relation to simulation-based learning: factor 1 – Adventurous immersion and factor 2 – Constructive Criticism.	75%
Ha, 2014	Korea	44 Nursing undergraduate students	Simulation	39 statements; Expert Evaluation	Extraction Method: PCA; Rotation Method: Varimax	It identified three different response arrangements in relation to video-assisted debriefing (VAD) with Nursing students: Factor I (VAD helps self-reflection; strategic view), Factor II (VAD makes us tired and humiliated; reluctant view) and Factor III (VAD boosts self-confidence; forward view).	75%
Paige & Morin, 2015a	USA	44 Nursing professors	Simulation	60 statements; Interview	Extraction Method: PCA; Rotation Method: "Non-rotated"	It revealed that Nursing educators share a fundamental perspective of Facilitating Discovery (Factor A) with the use of simulation. Two secondary bipolar factors (Factors B and C) revealed that educators have opposite views on student role assignment, degree to provide student support, and when and if to interrupt a simulation.	100%
Paige & Morin, 2015b	USA	45 Nursing undergraduate students	Simulation	60 statements; Questionnaires and previous studies	Extraction Method: PCA; Rotation Method: Varimax	It revealed that Nursing students hold five distinct and uniquely personal perspectives on simulation design, characterized in the study as factor 1 – The perspective “Let me show you”, factor 2 –	75%

Table 1 - Characteristics of the Included Studies (n=13).

1st Author, Year	Place	Participants	Used Technology	Qualitative Step	Quantitative Step	Key Results	MMAT Quality Score*
						The perspective "Stand by me", factor 3 – The perspective "The agony of defeat", factor 4 – The perspective "Let me think it through", factor 5 – The perspective "I'm engaging and so should you".	
Landeen et al., 2015	Canada	12 professors 21 Nursing undergraduate students	Simulation	42 statements for students; 40 statements for professors; Focus group Expert evaluation and previous studies	Extraction Method: PCA; Rotation Method: Not declared	Professors were positive about learning opportunities supported by clinical simulation. Participants' points of view did not include traditionalists nor help seekers, who were more critical of this teaching methodology, as found in a previous study. The only response arrangement found was named Positive Enthusiasts. Among students, three response arrangements were found: factor 1 – Challenge seekers, factor 2 – Realistic embracers and factor 3 – Support seekers.	75%
Ha, 2016	Korea	44 Nursing undergraduate students	Simulation	40 statements; Literature review and interview	Extraction Method: PCA; Rotation Method: Varimax	Three distinct response arrangements came up: Factor I (C-SOSCE stimulates self-study; self-directed learning perspectives), Factor II (C-SOSCE promotes self-confidence; practical learning perspectives) and Factor III (C-SOSCE needs proficient personnel; constructive learning perspectives).	75%

Table 1 - Characteristics of the Included Studies (n=13).

1st Author, Year	Place	Participants	Used Technology	Qualitative Step	Quantitative Step	Key Results	MMAT Quality Score*
Roberts et al., 2018	USA	2013–2014: 113 Medicine students 2014 –2015: 108 Medicine students 2015–2016: 115 Medicine students	Videos	37 statements; Literature review, expert evaluation and previous studies	t-Test; Kruskal-Wallis test; Mann-Whitney test; Bonferroni correlation: mean scores of the item exam were compared between both student groups in the traditional curricula and students in modal curricula. Factors were not rotated.	It identified that in comparison to the traditional curriculum, mean scores on the renal physiology final exam were higher after implementation of the new curriculum: 65.3 vs. 74.4 (P <0.001) with year 1 and 65.3 vs. 79.4 (P <0.001) in the second year. After the new curriculum, students were more likely to agree with the statement: “I wish other courses were taught like this one”. The qualitative analysis revealed how the video-based curriculum improved students’ engagement and satisfaction.	50%

Note: *MMAT: Mixed Methods Appraisal Tool (Pluye et al., 2011). Source: Articles included in this review.

Table 2 - MMAT* Quality Assessment for Mixed Methods Studies.

1 st Author, Year	Item number in the checklist											%
	1	2	3	4	1	2	3	4	1	2	3	
Miller et al., 1998	1	1	1	0	0	0	1	1	1	1	0	75
Coogan et al., 2006	1	1	1	0	1	1	1	1	1	1	0	75
Valaitis et al., 2007	1	1	1	1	1	0	1	1	1	1	0	75
Akhtar-Danesh et al., 2009	1	1	1	0	1	0	1	1	1	1	1	75
Baxter et al., 2009	1	1	1	0	1	0	1	0	1	1	1	50
Petit dit Dariel et al., 2013	1	1	1	0	1	1	1	1	1	1	1	75
Yeun et al., 2014	1	1	1	0	1	0	1	1	1	1	1	75
Ha, 2014	1	1	1	0	1	1	1	1	1	1	1	75
Paige & Morin, 2015a	1	1	1	1	1	1	1	1	1	1	1	100
Paige & Morin, 2015b	0	1	1	1	1	1	1	1	1	1	1	75
Landeen et al., 2015	1	1	1	1	1	0	1	1	1	1	1	75
Ha, 2016	1	1	1	0	1	1	1	1	1	1	1	75
Roberts et al., 2018	0	0	1	1	1	1	1	0	0	1	1	75

Note: Each domain is formed by 4 criteria, which were assessed as: 1, criterion met; 0, criterion not met or unable to determine. *MMAT: Mixed Methods Appraisal Tool (Pluye et al. 2011).
Source: Articles included in this review.

3.1 Description of Q method in the Studies

Table 1 presents the specific characteristics of the method used by the researchers to develop the studies: how the statements were constructed; some authors consider that the sample data characterize the qualitative step of Q method (Couto et al., 2011; Ramlo, 2016); the method for extracting the correlation of the arrangements of the response sets and factorial rotation were characterized in these studies as the quantitative step of Q method.

Q sample varied from a minimum of 29 to a maximum of 60 statements, with 46% (n=6) of the studies using between 40 and 49 statements. The method of data extraction was Centroid in 38% (n=5) of the studies, and Principal Component Analysis (PCA) was used in 54% (n=7). Data analyses are performed by different programs: PQMethod in 61% (n=8) of the studies, PC-QUANL in 13.4% (n=2), PCQ in 7.7% (n=1), and Qanalyze in 7.7% (n=1). One study (7.7%) used the STATA software to analyze data.

Despite being involved in philosophical discussions since its origin (Stephenson, 1935), Q method is presented as MMR in all the studies (Table 1) (Akhtar-Danesh et al., 2009; Coogan, Dancy & Attree, 2005). Its qualitative component appears in the first phase of the method through the construction of the concourse, and subsequently, in the Q set or Q sample (Coogan et al., 2005). In addition, manual rotation of the factors and interviews and open-ended questions could be inserted after the quantitative phase in the application of the Q set (data collection), to enable the collection of more information and assist in the process of analysis and interpretation of these factor matrices, or to better estimate Q sorts (Petit dit Dariel et al., 2013).

Concerning the construction of the Q sample, Q set, or Q statements, the authors used several techniques, such as interviews with the target audience in 30.8% of the studies (Ha, 2016; Miller et al. 1998; Paige & Morin, 2015a; Petit dit Dariel et al., 2013; Yeun et al., 2014), gathering of literature in 38.5% (Baxter et al., 2009; Ha, 2016; Petit dit Dariel et al., 2013; Roberts et al., 2018; Yeun et al., 2014), focus groups in 23.1% (Akhtar-Danesh et al., 2009; Coogan et al., 2005; Landeen et al., 2015), questionnaires in 23.1% (Baxter et al., 2009; Paige & Morin, 2015b; Valaitis et al., 2007), assessment by experts in 30.8% (Ha, 2014; Landeen et al., 2015; Paige & Morin, 2015b; Roberts et al., 2018), and Q set used in previous studies in 30.8% of the articles (Coogan et al., 2005; Ha, 2014; Landeen et al. 2015; Paige & Morin, 2015b; Roberts et al., 2018). The Q sample items represent the sample size instead of the quantitative representation with the number of people participating in the study.

The participant group or P set were the names attributed to the participants of the Q study. The size varies, but for the authors who created the method, the gold standard is a group formed by 40 to 60 participants (Watts & Stenner, 2012). Of the studies gathered in our review, 54% had between 40 and 60 participants (Akhtar-Danesh et al., 2009; Ha, 2014, 2016; Landeen et al. 2015; Miller et al. 1998; Paige & Morin, 2015a, 2015b), 30.8% had 20 to 39 participants (Baxter et al., 2009; Petit dit Dariel et al., 2013; Valaitis et al., 2007; Yeun et al., 2014), and 15% had more than 100 participants (Coogan et al., 2005; Roberts et al., 2018).

The quantitative component is characterized by the analysis of the response arrangements (Q sort), in which each statement receives a score corresponding to the rank assigned to it by each respondent; for example, “strongly agree” to “strongly disagree”. The different arrangements are correlated and their factor analysis is carried out. When correlations are found between different arrangements, it is considered that there is a tendency to give importance to the same statements (Novaes, 2020; Stenner & Stainton-Rogers, 2004; Watts & Stenner, 2012).

In the response arrangements, the Centroid method was used for the extraction of correlations (Coogan et al., 2005; Petit dit Dariel et al., 2013; Valaitis et al., 2007), or the PCA extraction method (Ha, 2014, 2016; Landeen et al., 2015; Paige & Morin 2015a), or both (Baxter et al., 2009). Factor rotation after the correlation of the arrangements was performed in Varimax (Baxter et al., 2009; Ha, 2014, 2016; Landeen et al., 2015; Paige & Morin, 2015b; Yeun et al. 2014), and one study chose not

to rotate them (Paige & Morin, 2015a). In addition, in some studies factors were identified and labeled by the judgment of a team of experts in the researched domain, in a process called manual rotation of the factors (Coogan et al., 2005; Ha, 2016; Valaitis et al., 2007). This latter method is defended by classical and theoretical researchers as being the difference in relation to R methodology, as it enables to have a qualitative lens to explore factors, transforming the study into a hybrid one (Ramlo, 2016).

The researchers who use Q method highlight that it is not merely a measurement method for testing validity and reliability; rather, it is an interactive process in which participants classify a series of content-sensitive statements, creating a forced and normal distribution, and this distribution allows a more sophisticated analysis of the respondents' data (Akhtar-Danesh et al., 2009; Cross, 2005).

The studies emphasize that Q method is a strategy to find different perception patterns and disregard the importance of its number distribution in a larger population (Baxter et al., 2009; Petit dit Dariel et al., 2013; Valaitis et al., 2007); thus, it does not focus on the normal distribution pattern. However, Roberts et al., (2018) used Q sort data from a preliminary study (Roberts et al., 2015), and conducted only a factorial analysis to apply different statistical tests.

3.2 Using digital technologies in Health Professions Education

In the studies gathered in this systematic review, the primary experience we found regarding the use of digital technologies was simulation, and students and professors perceive it as a supportive learning approach that complements clinical practice (Yeun et al., 2014). However, it is necessary to offer support to students and professors, so that they know the process in which they are included and the tools they are using (Ha, 2016).

The use of e-learning as a support to education and learning in the health area (Coogan et al., 2005; Petit dit Dariel et al., 2013; Valaitis et al., 2007) through virtual learning platforms (Coogan et al., 2005) and videoconference (Valaitis et al., 2007) was also characterized as a facilitating tool. Nevertheless, there are time and training barriers and cultural perception constraints for the adoption of e-learning.

The employment of digital technologies enabled a new cultural training, similarly to what happened with the emergence of books, printed media, and the radio. Today, with the development of the internet, there are several types of readers (contemplative, moving, immersive, and omnipresent) in cyberspace, which is dynamic and in constant transformation (Santaella, 2013). To mediate health education, it is necessary to recognize these reader profiles in the classroom and the forms of communication they use.

The profile patterns of students (Baxter et al., 2009; Landeen et al., 2015; Valaitis et al., 2007; Yeun et al., 2014;), professors (Akhtar-Danesh et al., 2009; Baxter et al., 2009; Petit dit Dariel et al., 2013; Valaitis et al., 2007), and employees (Valaitis et al., 2007) (Defenders of digital technologies, Humanists, Skeptics and Pragmatists) are characterized as groups of response arrangements with a tendency to give importance to the same statements, as presented in Table 1, and ratify the need to understand how digital culture is experienced in the education of health professionals in the 21st century.

The inclusion of the new Information and Communication Technologies (ICT) in Health Professions Education is a reality; therefore, to educate competent professionals to perform their functions ethically, aware of the social implications of their actions in the digital society, it is fundamental that educators and professionals understand these technologies and master their applicability (Franco de Sá, Nogueira & De Almeida Guerra, 2019; Organização Pan-Americana da Saúde, 2018; Tamim & Grant 2016; World Health Organization, 2019).

Adding Q method to the health professions' repertoire of research and teaching can expand clinical research opportunities, improve customer service, develop researchers' capacity at the beginning of their careers, and enable the adequate understanding of students' attitudes towards clinical practice (Ha, 2015; Lim et al., 2021).

4. Discussion

In summary, the results showed that Q method can be used to explore students' and professors' attitudes and viewpoints towards the inclusion of digital technologies in the classroom, converting human subjective perspectives into objective results about the phenomenon of digital culture. From this perspective, learning this method and the nature of its mixed research type seems to be appropriate for developing studies on health sciences and Health Professions Education.

Assessing the quality of MMR such as the Q method is challenging and has limitations, but MMAT (Pluye et al., 2011) enabled us to assess qualitative and quantitative components concomitantly. By analyzing the articles' quality, it is possible to identify in what aspects the research using this method needs to be improved.

By performing the analysis and interpretation through a qualitative meta-summarization, our study enabled us to relate studies on the same phenomenon – the use of digital technologies in Health Professions Education – to heterogeneous applications of Q method.

There are variations in the way in which Q method is developed in the analyzed articles: for the construction of concourse and Q set, many techniques were used, like interviews, previous studies, gathering of literature, and focus groups; the extraction of correlations was performed by Centroid or Principal Component Analysis (PCA). After the correlations were extracted from the respondents' response arrangements, submission to factorial rotation or the non-utilization of this procedure were identified.

The method has some disadvantages, like the length of time spent in the Q classification process (one or two hours per individual (Ha, 2016; Yeun et al., 2014)) and difficulties in recruitment and participant adherence (Landein et al., 2015). Furthermore, the inclusion of digital technologies in Health Professions Education is still in progress and, for this reason, many beliefs and values may have been built based on the exposure of participants to settings with limitations (Akhtar-Danesh et al., 2009; Baxter et al., 2009).

In spite of its long history, Q method still is an innovative methodology, unknown in many disciplines, journals and countries (Lim et al., 2021; Van Exel & Graaf, 2005). For instance, recent studies developed in Brazil, where the main authors of the present research work and carry out their studies, have reported that the use of Q method is still considered incipient in the country (Brandão et al., 2017; Novaes, 2016).

We conducted a search for studies developed in the area of health in Brazil using the descriptors and databases selected for this review. Only one article was found (Santos & Schor, 2003). In a search conducted without defining descriptors, we found another article in the health area (Serralta et al., 2007). In these studies (Santos & Schor 2003; Serralta et al. 2007), the authors adapted Q method; they did not use its traditional concepts (Brown, 1980; Watts & Stenner, 2012). Therefore, they were not included in this review, as they did not meet the eligibility criteria.

4.1 Strengths and limitations

For some authors, the fragility of the method lies in the fact that study participants are few and selected by convenience, which limits data extrapolation (Kampen & Tamás 2013). However, other authors (Ramlo, 2019; Stenner & Stainton-Rogers, 2004) defend that this feature is, in fact, the advantage of the method, as it enables to know different perspectives of the investigated phenomenon through a hybrid combination, the combination of qualitative and quantitative dimensions. This frequently causes discomfort in the researchers, because they must pay more attention to the subjective and interpretative dimensions.

There are divergences in the views and consensuses regarding Q method within the mixed methods, quantitative methods and qualitative methods communities (Ramlo, 2019), which generates diversity in the vocabulary related to the method, both in the descriptors and in the keywords. This may have restricted the scope of the searches, returning the ones that

used only general descriptors, which is a limitation of our study. In addition, the heterogeneity present in the stages of the method – for example, in the construction of the concourse, in the development of the Q sample, and in the analysis and interpretation of the Q sort - may be a barrier to the adoption of this method by young researchers.

4.2 Implications for practice and research

Nowadays, the unexpected pandemic that was started in 2020 by the Severe Acute Respiratory Syndrome Coronavirus 2 (Sars-CoV-2), causing the disease COVID-19, has accelerated the introduction of digital technologies in the teaching and learning process in higher education. The need for emergency remote teaching arose in order to maintain academic activities because of the imposition of quarantines and social distancing (Hodges, Moore, Lockee, Trust & Bond, 2020; Rocha & Sampaio, 2020). In the area of health, the main challenges are to develop the faculty's set of skills and competencies in the use of digital technologies, to include ICT in health curricula and clinical placements, and to promote the professional development of the personnel involved in the educational mission of colleges and universities (Cox, Seaman, Hyde, Freire, & Mansfield, 2020).

5. Conclusion

Our findings showed that Q method is often cited as appropriate to be applied to the study of Health Professions Education mediated by digital technologies. We believe that the methodological design of this study can serve as a model for others investigating similar research questions and stimulates further research in the field of Health Professions Education with the use of Q method. Health educators face the challenges of intentionality in relation to the concept of health, to the proposed care model, to the strategies used to develop skills and produce knowledge in health education, and to the inclusion of digital technologies in its teaching. In view of the pressing need for education changes, we believe that using MMR, particularly Q method, to investigate teaching culture and practice, can successfully support the renewal of Health Professions Education. The authors suggest that future investigations use the Q Method to understand which elements of online technology are adopted in pedagogical practice by Brazilian public university professors and identify evidence on the recognition and appreciation of digital technologies in the teaching and learning environment.

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Author`s contributions

JSYR, MCBG, and AMPS contributed to the study design, revised data, and manuscript writing. MS acquired the initial literature search and contributed to the study design. NRB, JMD, and MNFF aided in the investigation, data collection, and analysis, writing - original draft, writing - review, and editing. SSS, JBBF, and ACF conceptualized the research, conceived the study, undertook project administration, supervision, funding acquisition, coordinated all data collection and analysis and writing - original draft, writing - review, and editing. All authors read and approved the final manuscript.

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