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The Case for Q-Methodology in Computing Education Research

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Motivation

Q-Methodology is a useful tool to help understand differing perspectives on a topic based on how people think, as opposed to via gender, role or ethnicity [1]. However, Q-Methodology is seldom used in computing education research despite the importance of understanding perspectives on how educational initiatives are working in such an evolving subject area. This poster therefore provides an overview of the prevalence of Q-Methodology in existing literature, and details five examples of where Q-Methodology has been used successfully in computing education research, and advocates for its use in future work.

Research Question

How is Q-Methodology utilised as a mixed-methods research approach within computing education research?

Q-Methodology in the Literature

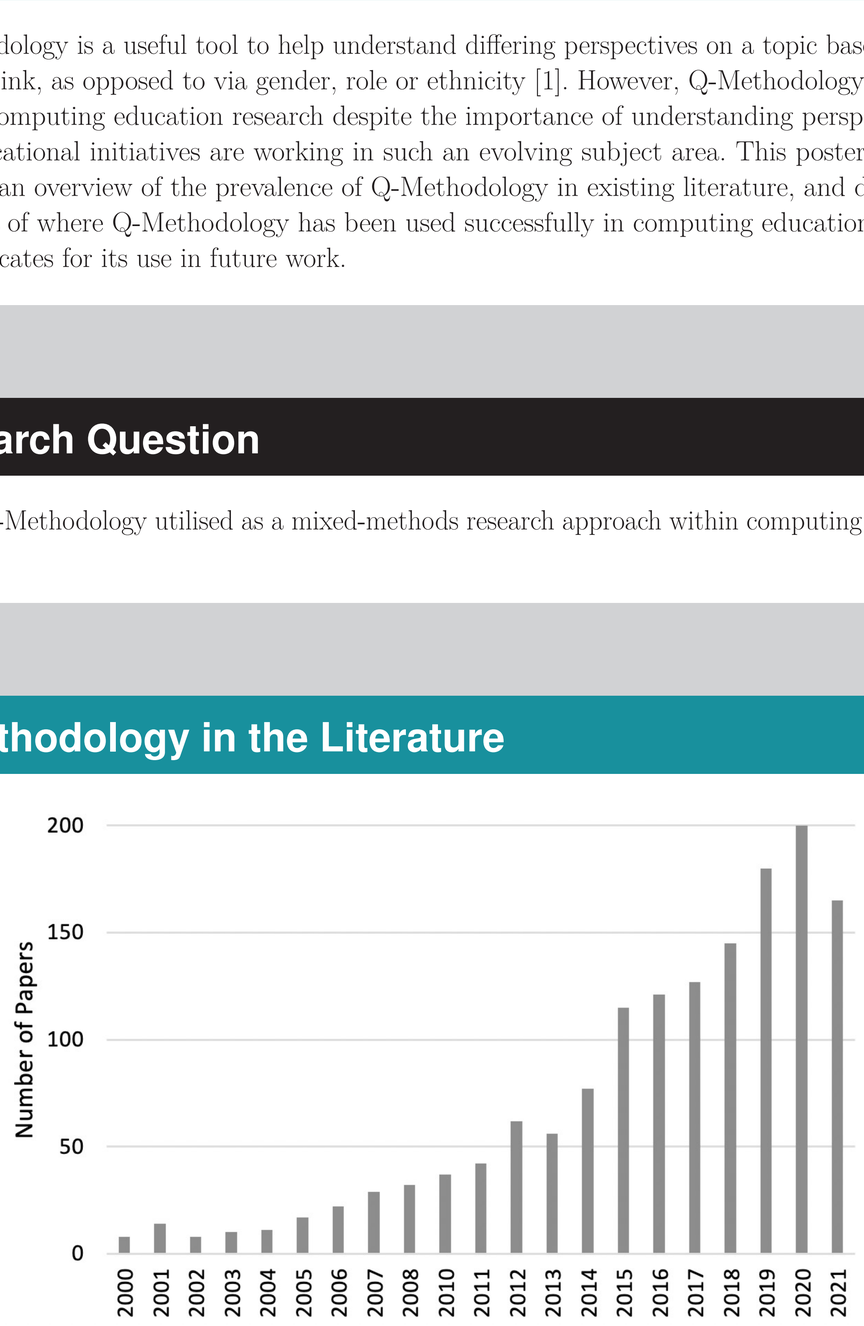

Figure 1: Search Results for 'Q-Methodology' (2001-2021) on Web of Knowledge. Data sourced from http://apps.webofknowledge.com/.

Q-Methodology has been around since the 1930s, but it is only in the past decade it has been used more widely. A search of "Q-Methodology" on Web of Science, a publisher-independent global citation database, yielded 1511 results from 2000-2021, with eight papers in 2002 and a high of 200 papers in 2020 (See Figure 1). This reflected all papers that utilised Q-Methodology, and by combining other search terms with "Q-Methodology", such as "Education" (421 results), "Computing" (23 results), and "Computer Science" (7 results), it is evident how Q-Methodology is currently rarely used for computing education research. A search of "Q-Methodology" elsewhere yielded similar results with ACMs digital library yielding 39 results and IEEE Xplore yielding just 16 results. However, where Q-Methodology has been used in computing education research, it has been used successfully.

Next Steps

Q-Methodology has been shown to provide detailed and useful insights into improving computing education and educational practice. It provides a flexible and comprehensive approach that has great potential to inform computing education research through the ability to acquire perspectives in a way rarely utilised. It is therefore recommended that computing education researchers consider learning about (for instance see [1] about the Q-Methodology process in more detail) and incorporating Q-Methodology into future work, so that the teaching and learning of computing can be improved, and unrealised perspectives can be realised and acted upon effectively.

Q-Methodology in Computing Education Research

One study investigated the perspectives of primary school computer science teachers (n=69) from the Czech Republic regarding what they perceived to be the most/least important topics to be taught in computer science [2]. By using Q-Methodology, it was possible to better understand teachers views of specific topic areas, with the authors concluding this understanding is necessary to influence the change in thinking of computer science teachers to successfully implement curriculum reform [2]. Meanwhile, another study investigated the formulation of a school ICT policy in a South African primary school [3]. 23 teachers completed a Q-Sort (see Figure 2 for an example) resulting in three distinct groups of teacher 'points of view'. Q-Methodology allowed these different views to be heard, and also the most/least important factors needed for the school ICT policy [3].

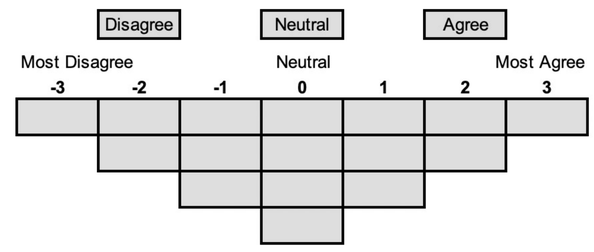

Figure 2: Example Q-Sort Grid

Q-Methodology has also been used within higher education, with one author explaining three different studies in this context [4]. The first used Q-Methodology as part of a program evaluation to determine student perspectives on a bioinformatics course. Computer science and biology students completed a Q-sort of 29 statements with results indicating how course changes eliminated some student concerns regarding programming, and promoted a more positive view of bioinformatics [4]. The second study investigated faculty views about the creation of a new School of Technology in a US university. Ten committee members sorted 50 statements which were originally created by participants themselves. The main benefit of Q-Methodology within this study was the identification of six consensus statements amongst participants regarding potential benefits and concerns with the creation of the new Technology School [4]. The third study investigated students' views of learning physics as part of an engineering course. 18 students completed a 30 statement Q-Sort [4], and by using Q-Methodology, it was possible to reveal four viewpoints about learning physics on the course with results indicating what changes to course activities needed to be made. Hence, helping to reveal the need for interventions that might assist student learning [4].

Using Q-Methodology results to help improve higher education studies has also been used in Portugal. One study investigated teachers' perceptions about course improvements for their Informatics and Engineering program based on suggestions from students [5]. By gathering viewpoints from 250 people across 65 teams, a concourse of 112 statements was created, and later six teachers completed a 54 statement Q-Sort. Factor analysis resulted in the identification of two distinct factors, and using Q-Methodology in this study allowed for an understanding of students' perspectives on course improvements through the lens of what teachers view as most important [5].

Finally, a more recent study compared grouping results using both clustering algorithms and Q-Methodology which focused on engineering students' (n=28) perceptions of learning during their cooperative education experiences [6]. Q-Methodology allowed the authors to understand and group students more effectively by how they learn, as opposed to externalised characteristics such as race, or socioeconomic status [6]. This has important implications for teaching and learning, as this type of insight would allow for more catered learning opportunities for students.

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