

Towards an understanding of research design: a critical evaluation of philosophical underpinnings, methodology and methods in research.

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Introduction

At the start of my teaching journey, my practice was heavily shaped by prior experiences - drawing inspiration from my previous vocal teachers, masterclasses, workshops and independent study. As Bridges (2017) says, much of our thinking has been shaped by our experience and in our understanding of education, we draw more or less from these experiences. However, in recent years, I have been diving deeper into voice science, and this strongly influenced my vocal pedagogy and the way I look at the voice. Bozeman (2007) sees the same trend: many voice teachers combine their own personal pedagogic history with voice science research in order to confirm or adjust their pedagogic approach. Rooney (2016) goes a step further and states that teachers must base their teaching on an in-depth understanding of how the vocal mechanism works, rather than just teaching how they were taught.

Voice research is a fascinating field. As seen in Figure 1, the field of voice research consists of scientific research on the one side - like the study of acoustics, biomedical research, or cognitive science, and on the other hand studies of arts and humanities. Both sides have informed our practice as voice teachers in a significant way (Maxfield & Ragan, 2021). In the course of this study I hope to contribute to the area of voice research, from a combined perspective of voice teacher and voice researcher to bridge the gaps between practice and theoretical research.



Figure 1: Voice Research (Maxfield & Ragan, 2021)

1. Setting the field

After choosing a research topic, the next step is to decide on *how* to research the topic. The choices of research methods and methodologies are plenty, and the researcher should be able to justify the choices made during the research process (Crotty, 1998). The research paradigm - the researcher's worldview through which knowledge is filtered (Kuhn, 1962; in Leavy, 2014) - will heavily shape the choices that the researcher makes in the process and how the researcher will interpret the findings (Guba & Lincoln, 1998). In this paper, three main paradigms - (post)positivism, constructivism, and pragmatic (Mertens, 2015; Creswell & Creswell, 2018) - will serve as the framework to discuss ontology, epistemology, methodology and methods, as well as ethics, limitations and practical considerations.

Easterby-Smith et al. (2015) use the four rings model (Figure 2) to explain the relationship between the concepts of ontology, epistemology, methodology and methods. *Ontology* consists of basic assumptions about the nature of reality (Easterby-Smith et al, 2018). *Epistemology* refers to the theory of knowledge (Moser, 2002). Epistemology and ontology are closely linked, because one cannot justify a scientific analysis, without knowing the nature of reality (Morrow and Brown, 1994; Crotty, 1998). *Methodology* can be described as a way to systematically solve the research problem (Kothari, 2004). Throughout this paper, three methodologies will be discussed: qualitative, quantitative and mixed-method. Although quantitative and qualitative research may seem opposites, they should be seen as a continuum, instead of distinct categories, with mixed methods in the middle, incorporating both qualitative and quantitative research (Creswell & Creswell, 2018; Hesse-Biber, 2017). Finally, our *research methods*, methods and techniques that are used for conducting research (Kothari, 2004), are tools for data collection (Leavy, 2014; Hesse-Biber, 2017). The adequacy of a research method depends on the purpose of the research and the questions being asked (Locke, 1989, in: Seidman, 2006).

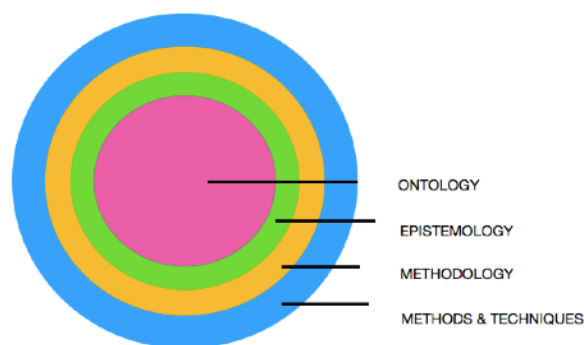


Figure 2: The four rings model, based on Easterby-Smith et al. (2015)

Hitchcock and Hughes (1995) state that our ontological views form the base of our epistemological views, which in turn will influence our methodological decisions, leading to decisions about methods and techniques.

Each of the paradigms discussed in this paper will have different views on these concepts, but although they have strong opinions about these concepts, they are not deterministic (Morgan, 2014). That means for example that the constructivist paradigm will serve as a framework to discuss qualitative research, because they are strongly associated with each other, but it doesn't mean that the constructivist paradigm will exclude other research methodologies.

2. The (post-)positivist paradigm

Researchers in the (post-)positivist tradition begin with a hypothesis - a statement or assumption about the relationship between variables or phenomena (Mouton & Marais, 1996). Then the researcher collects data that either supports or refutes these hypotheses, then makes necessary revisions and conducts additional tests (Creswell & Creswell, 2018).

Positivism believes that all true knowledge is based on sense experience, and can be understood by observation and experiment (Cohen et al., 2007). It relies on deductive methods to verify a priori hypotheses, where functional and causal relationships can be derived from independent and dependent variables to make predictions about the phenomenon in question (Park et al., 2020; Guba and Lincoln, 1998). Post-positivism can be seen as a critical successor of positivism, challenging the traditional notion of the absolute truth of knowledge (Philips & Burbules, 2000; in: Creswell & Creswell, 2018) While positivism strives to verify the hypothesis, post-positivism strives to falsify them (Guba and Lincoln, 1998).

The use of the (post-)positivist paradigm in vocal pedagogy research

In the past century, there has been much research to understand the singing voice from both a physiological and acoustic perspective, and it has allowed us to measure the voice in increasing detail (Harrison & O'Bryan, 2014).

An example research design for the (post)positivist paradigm in the field of voice research, is a study by Lebowitz and Baken (2009). In their study 'correlates of the belt voice: a broader examination', their goal was to get a deeper understanding of the mechanisms associated with successful belting and to clarify the definition of belting in physiological and acoustical terms, using the electro-glottographic waveform to measure the closed quotient (CQ) and speed quotient (SQ) in belt and legit.

Their goal of understanding the mechanisms show a realist ontology and an objectivist epistemology - both terms will be explained in this paragraph. They used a quantitative inquiry to measure the CQ and SQ in the form of a controlled experiment, with a relatively large sample size. They were looking for statistically significant differences to support their a priori hypothesis.

2.1 (Post-)Positivism and ontology

The **ontology** belonging to positivism is (naive) realism. *Realism* assumes that there is one truth and is driven by unchangeable natural laws and mechanisms (Guba and Lincoln, 1998). Post-positivism is based on critical realism. *Critical realism* accepts that there is a real reality, where knowledge exists independent from human perceptions and constructions, but they also acknowledge that reality is only imperfectly apprehendable (Guba and Lincoln, 1998; Crotty, 1998; Given, 2008).

2.2 (Post-)Positivism and epistemology

The **epistemology** belonging to positivism is objectivism. *Objectivism* is the notion that an objective reality exists outside the individual mind (Given, 2008). Knowledge is objective and empirically verifiable (Crotty, 1998). Post-positivists belief in modified objectivity, holding objectivity as an ideal, but also recognising that it can not be achieved in any absolute sense (Guba, 1990).

2.3 (Post-)Positivism and methodology

The **methodology** that is strongly associated with positivism is quantitative research. *Quantitative research* refers to research methods that collect, analyse and display data in a numerical rather than a narrative form, embracing reliability (if the instrument consistently produces the same results in the same controlled environment), objectivity (are the results free from bias), and validity (how accurately the study answers the hypotheses it was supposed to answer) (Denzin & Lincoln, 1998). The goal of quantitative inquiries is to help the researcher make inferences about the correlation amongst variables that are generalisable to a broader population of interest (Creswell & Creswell, 2018).

2.4 (Post-)Positivism and methods

Methods for quantitative inquiry include surveys and experiments. *Surveys* provide quantitative data about a phenomenon within a population, by studying a representative sample of that population (Fowler, 2014; Creswell & Creswell, 2018). Questionnaires and structured interviews are two of the most common examples of a survey design (Leavy, 2014). Questionnaires are economical and relatively cheap, usually have a wide coverage, and are easy to interpret because of pre-coded, standardised answers, but the depth of answers is limited in nature compared to other research methods (Denscombe, 2003). Structured interviews work with a pre-determined list of questions, that promotes standardization of both the asking of questions and the recording of answers, but the interviewer effect - the way the questions are asked by the interviewer, may pose a threat to the validity (Bryman, 2012).

In an *experiment*, one or more variables are being manipulated within a controlled environment, in order to evaluate how this manipulation impacts an outcome of interest (Creswell & Creswell, 2018). There are many subtypes of experiments such as randomised experiments, quasi-experiments, natural experiment and correlational study (Shadish et al., 2002). Experiments strive for reliability, replicability and validity, but the researcher should be aware of internal and external validity threats (Bryman, 2012).

2.5 The role of ethics in (post-)positivism

In the (post-)positivist view, researchers have the **ethical** obligation to conduct 'good' research, including the use of a valid research design, research competency, identifying consequences of the research, and an appropriate sample selection. (Mertens, 2015). Lodico et al. (2006) include informed consent, protecting participants from harm and ensuring confidentiality.

2.6 Limitations and practical considerations of (post-)positivism

Guba and Lincoln (1998) describe the **limitations** of the (post)positive paradigm. The most important is that positivist research leaves out the social context, and therefore it excludes underlying meanings and explanations. Also, although objective data strives towards generalisability, they are not necessarily true for all individual cases.

There are also **practical considerations**. Callaghan (2014, in: Winter, 2020) describes several issues with scientific research for the practice-based voice researcher. There is limited access to medical equipment - and even if there is access, the sample sizes are very small due to the high cost of the research, forming a threat to the statistical significance. Often professional practitioners use convenience samples - for example voice students they work with, which forms a threat for the validity of the research. A solution would be to strengthen the collaboration between voice teachers and voice scientists.

The use of the (post-)positivist paradigm in my professional practice.

Despite the limitations of (post-)positivist research, I believe that the current trend of using voice science in my professional practice can benefit from a (post-)positivist approach. Objective analysis of the vocal mechanisms with full medical equipment, is out of reach for me as a beginning researcher, but there are other ways to analyse the voice in a systematic, objective way, like the use of spectrographs.

I am using spectrograms in my classroom to analyse onsets in belting. Moriarty (2015) write that a glottal onset can be beneficial in maintaining speech-like quality. My assumption is that belt quality can benefit from a glottal vocal onset - when phonation begins with a harsher, often audible articulation initiated by the sudden release of air built up behind fully approximated vocal folds (Hoch, 2014). The spectrograms will provide me with objective data - was the glottal onset indeed a glottal onset? Or was the result something different from what the student intended (although a different paradigm will be needed to investigate this question). This has been just an initial orientation, but I believe it might be helpful for my future research.

3. The constructivist paradigm

Constructivism, or interpretivism, is the view that all knowledge is socially constructed - human beings are actively constructing and making sense of realities they encounter, and the researcher must interpret these social constructs (Mouton & Marais, 1996; Crotty, 1998). Constructivism builds upon the hermeneutic tradition - the study of the theory and the practice of understanding and interpretation, as well as phenomenology - the study of experience through reflection (Given, 2008; Mertens 2015).

The goal of research from a constructivist point of view is to understand the subjective world of human experience (Guba & Lincoln, 1989). The research process is a process of discovery, because the researcher has to interpret the world from the perspective of the research subjects (Mouton & Marais, 1996).

The use of the constructivist paradigm in vocal pedagogy research

Qualitative inquiry seems to be a common practice in voice pedagogy research, using expert opinions, perspectives from voice pedagogues or student observations.

An example research design for the constructivist paradigm, is a study by Roll (2019). The aim of this study, 'The Female Broadway Belt Voice: The Singer's Perspective', was to find a clear understanding of the techniques and strategies used by female belters to successfully produce a belt sound. The study was a qualitative design, using interviews and observations. Interview questions included questions such as 'what does it feel like to belt higher than a C above middle C?'. The field notes taken during the observations included dialogue exchanges between singers and teachers. The individual experiences were interpreted by the researcher looking for similarities, differences and emergent themes.

The goals of understanding the belt voice through the singers perspective show a relativist ontology and a subjective epistemology. Qualitative inquiry methods - interviews and observations - were used in this study. The researcher was interested in personal experiences within a social context.

3.1 Constructivism and ontology

The **ontology** belonging to the constructivist paradigm is relativism. *Relativism* assumes that there are multiple truths, depending in the perspectives from which we observe (Easterby-Smith, et al., 2018). These realities do not exist independently, they are constructed by the people who live in it (Guba & Lincoln, 1998)

3.2 Constructivism and epistemology

The **epistemology** belonging to positivism is subjectivism. *Subjectivism* is the belief that knowledge is subjective and that there is no external or objective truth (Guba, 1990). Unlike positivist research, where researcher and participants are strictly separated, the inquirer and the inquired into can not be separated (Guba & Lincoln, 1989). Subjectivity is acknowledged and valued (Leavy, 2014).

3.3 Constructivism and methodology

The **methodology** that is strongly associated with constructivism is qualitative research. *Qualitative research* focuses on research in a natural setting, often involving a multi-method, interpretative approach of the research subject, wherein the researcher often can be seen as a bricoleur (Denzin & Lincoln, 1998). Since there is no objective truth, the criteria of validity, reliability and replicability are not useful in judging the quality of qualitative research. Instead the criteria of

credibility (confidence in the truth of the research findings), transferability (transferring the results to other contexts), dependability (the stability of the findings over time), and confirmability (the degree to which the results can be confirmed by other researchers), are being used (Guba & Lincoln, 1985; Korstjens & Moser, 2018).

3.4 Constructivism and methods

Methods for qualitative inquiry include ethnography, observations and case studies, interviews and focus groups, document analysis and (audio-)visual methods (Leavy, 2014; Creswell & Creswell, 2018). Both interviews and observations are common methods for data inquiry in voice pedagogy research.

Interviews gather knowledge through the conversational interaction between an interviewer and an interviewee (Given, 2008). It is a tool to understand the meaning people make of their experiences and can help to create a context to understand people's behaviour (Magnusson & Marecek, 2015). Although interviews are valuable to gather unique and important knowledge, Seidman (2006) discusses several disadvantages: they take a great deal of time and money - especially the transcription of interviews can be time-consuming (Bryman, 2012), making contact can be daunting for researchers and although qualitative research has gained ground in the last 30 years, some journals and professional organisations still have a preference for quantitative research.

Focus groups, which can be seen as a kind of group interview, generate qualitative data through researcher-led group discussion (Leavy, 2014). Leavy explains that focus groups will usually have a greater number of participants, while in-depth interviews provide more detail about the participant. More often the two methods are combined, starting with a focus group to gather introductory data, followed by in-depth follow-up interviews with several purposely selected participants. Krueger and Casey (2015) discuss the disadvantages of focus groups: focus group participants tend to intellectualise, they don't tap into emotions, participants may make up answers if they have limited or no experience with a certain question, they sometimes tend to produce trivial results, especially in larger groups, and dominant individuals can influence the results, although the skilful researcher can minimise this risk and even use it to its advantage.

Observation is a method to gather data, where the researcher observes human behaviour of the participant in its natural context, to gain a deep understanding of a particular topic (Given, 2008). Case studies can be seen as a category of observation. Case studies are a research method for qualitative research, but they may also be used for quantitative or mixed-methods research (Tight, 2022; in: Flick, 2022). Case studies can give valuable in-depth information about the participant, but questions of generalisability, value of comparison and the lengthy procedure are amongst the common concerns (Yin, 2018).

3.5 Ethics in constructivism

Constructivist researchers are bound to three **ethical** principles: beneficence (maximising good outcomes and minimising or avoiding unnecessary risks, harm or wrong) respect (treating people with respect and courtesy), and justice (ensuring that procedures are carefully considered) (Mertens, 2015). Because of the interpretative nature, the traditional positivist quality criteria of validity, reliability and replicability are not useful. Instead they are replaced by trustworthiness and authenticity (Guba and Lincoln, 1998).

3.6 Limitations and practical considerations of constructivism

Although qualitative research provides a lot of detailed and in-depth data, there are also **limitations**: qualitative research is too subjective, it is difficult to replicate, there are problems with generalisation and a lack of transparency (Bryman, 2012). Anderson (2010) adds that the research quality is heavily dependent on the skills of the researcher, and researchers are more easily influenced by researcher bias. Also, the presence of the researcher during the data gathering can affect the subjects' responses. Issues of anonymity and confidentiality can give problems when presenting the finding. *Insider research* - the researcher who studies a group to which they themselves belong - can limit the credibility of the research (Unluer, 2012). Although being an insider can be beneficial - the researcher has a good understanding of the group's culture, has the ability to interact in a natural way and has built an intimacy with the group (Bonner and Tolhurst, 2002; in: Breen, 2007), the researcher can also lose their objectivity and can have trouble balancing the role of insider and of researcher (DeLyser, 2001; in: Breen, 2007). **Practical considerations** include the volume of data making the process very time-consuming.

The use of the constructivist paradigm in my professional practice.

McCoy (2012) notes that there are aspects of how we sing on a practical level that go beyond quantitative analysis. On a physiological and acoustical level, we can analyse to a certain extent what is happening with the vocal mechanisms, but that omits how the students are experiencing it. What works for one student, does not necessarily work for another student. As Ragan (2020) says, the voice teacher works from the individual need of the student and tries as many approaches as possible until he discovers what will work for each individual student (Ragan, 2020).

A research area that I am interested in, is the transition between vocal registers in Musical Theatre singers. Because there is no consensus about the definition of the different registers, I expect that expert perspectives can help to clarify this. In-depth interviews might be a good starting point. But I am also interested in a student perspective on this topic. What do they experience, when they transition between the different registers?

3. The pragmatic paradigm

The pragmatic paradigm embraces ideas from both constructivism and positivism, in interaction with the research question and real-world circumstances (Tashakkori & Teddlie, 2009). Dewey (1925; in: Morgan, 2014) puts an emphasis on human experiences, that are on the one hand limited by the nature of the world, and on the other hand limited by the interpretations of these experiences. Instead of a knowledge-oriented approach, pragmatism therefore uses an action-oriented approach (Lodico, et al., 2006; Patton, 2014). Since the pragmatic paradigm places practice-based problems at the center of the research process, it is therefore appealing for the voice practitioner (Winter, 2020).

The use of the pragmatic paradigm in vocal pedagogy research

An article from Ragan (2018) will serve as an example for the pragmatic paradigm in vocal pedagogy research. Ragan developed a new framework for evidence-based voice pedagogy, out of a need to combine voice teacher expertise and experience, student goals and perspectives, and voice science. She acknowledges the need for rigorous, controlled scientific voice research on the one hand, but also states that there is need for anecdotal evidence and a link to the teaching practice.

This suggests both quantitative voice science research and also qualitative interpretation and experience, with an eye for the individual need of the student. As she states in the conclusion of the article, voice science research provides a foundation from which to build an approach, but the art of teaching comes from experience. The underlying framework is therefore pointing to a pragmatic approach.

3.1 Pragmatism and ontology

Pragmatism has the **ontological** view of an existential reality, believing that reality is a mixture of objective layers - stable elements that are possible to predict and control, and subjective layers - singularities and uncertain possibilities that can only be interpreted within their context (Dewey, 1925; in: Feilzer, 2010). Mertens and Tarsilla (2015, p. 437) describe the pragmatist ontology as "reality is continually created through experience in interaction and transaction with the world". Morgan (2007) calls this intersubjectivity - stating that there is one reality, but that all individuals have their own unique interpretations of that reality.

3.2 Pragmatism and epistemology

Pragmatism steps away from the traditional sense of **epistemology**. Dewey (1910; in: Morgan, 2014) describes knowledge as a process of inquiry, in which actions - the outcome of the inquiry process, serve as the basis for beliefs. Pragmatists view knowledge as being both constructed and real, based in the reality of the world one experiences and lives in (Morgan, 2014). Based on Dewey's transactional framework (Biesta & Burbules, 2003), Tashakkori & Teddlie (2009, p.70) describe the epistemological stance as "naturalistic and process-oriented organism-environment transaction".

3.3 Pragmatism and methodology

The **methodology** of pragmatism is strongly associated with *mixed methods* research (Tashakkori & Teddlie, 2009; Creswell & Plano Clark, 2018). Mixed methods research uses data collection and analysis, using both qualitative and quantitative approaches or methods, with an explicit integration of both quantitative and qualitative aspects (Mertens & Tarsilla, 2015).

One of the limitations of mixed-method research is that not all researchers are able to carry out both components (Reiss, 1968; in: Bryman, 2012). Hesse-Biber and Johnson (2015) state that mixed method research often asks for a team of specialists, able to build and cross bridges between the different disciplines, where communication between the different disciplines and research components, as well as how to combine tools and skills can be challenging aspects.

Advantages of using mixed-method research (Sale et al, 2002) are cross-validation, or triangulation - the use of multiple methods as an alternative to validation (Denzin & Lincoln, 1998), and the achievement of complimentary results, where one method can enhance the other (Morgan, 1998; in: Sale et al, 2002).

3.4 Pragmatism and methods

Since pragmatism is centred around the research question, it advocates the use of a **range of methods** that best serve the needs of the research (Hesse-Biber & Johnson, 2015). It is not simply a matter of 'more is better', the choice of methods must be appropriate for the research questions or research area, and quantitative and qualitative components should be related to each other from the start (Bryman, 2012).

There are different research designs for mixed methods research. Creswell and Creswell (2018) distinguish between three core mixed methods designs. The *convergent mixed methods design* gathers quantitative and qualitative data separately and the results are compared to see if they (dis)confirm each other. An example can be found in a study by DeAmbrose (2019), exploring the attitudes and perceptions of eighth grade students toward singing and choir participation in relation

to gender, voice mutation stage and method of music instruction, using quantitative data on singing interest and maturation, and interviews about the students' perception of vocal music in the curriculum, with the goal to see how the survey results and interview results can confirm each other. The *explanatory sequential mixed methods design* starts with quantitative inquiry and analysis, continued by a qualitative phase. An example by Gallo (2019), researched the effect of formative assessment strategies on students' singing accuracy, using a quasi-experimental design, followed by observations and interviews to further explain the findings from the quantitative study. The final one, *exploratory sequential mixed methods design*, starts with a qualitative phase, followed by a quantitative phase.

3.5 Pragmatism and ethical considerations

Ethically, pragmatism acknowledges a value-laden position of the researcher and therefore an acknowledgement of one's axiological position is an important part of the standard procedure (Biddle & Schafft, 2015). Maarouf (2019), in what he calls the necessary bias principle, states that the researcher should only be biased to a degree that is necessary to enhance his research and to meet the research requirements. Locke et al. (2013) also mention, amongst other things, the principle of right action (the moral rightness of the aims, processes and understandings of the research), the principle of critical self-reflexivity (including transparency) and the principle of communicative freedom (the rights of withdrawal and renegotiation).

3.6 Pragmatism and limitations and considerations

The pragmatic paradigm can gap the bridge between theory and practice, where research and practice, although both with their own possibilities and limitations, can cooperate and inform each other (Biesta & Burbules, 2003). Some researchers see pragmatism as a 'what works' method, which is problematic, because it leaves out choices about the goals to be pursued with the research, the philosophical underpinnings, as well as the means to meet the research goals (Denzin, 2012; Morgan, 2014). An emphasis on 'what works' often fails to answer the question of what works for whom and to what end (Biddle & Schafft, 2015).

Johnson and Onwuegbuzie (2004) discuss other limitations of pragmatism, including the difficulty to deal with cases of *useful but non-true* beliefs and *non-useful but true* beliefs, and the limited change it often results in, because of the immediate and practical nature of the results. Morgan (2007) therefore states that the pragmatic approach should strive for transferability of research results - the extent to which we can take the things that we learn with one type of method in one specific setting and make the most appropriate use of that knowledge in other circumstances. Hall (2013) states that pragmatists should prioritise consequential validity - the assessment of social consequences and implications through constant reflection.

The use of the pragmatic paradigm in my professional practice

As a professional practitioner, practical questions are usually underlying my research and the pragmatic paradigm seems therefore a good starting point.

A specific question that arose from my professional practice, is the role of the tongue in CCM singing. In my teaching practice in China, I notice that many students have tongue-retraction when singing Musical Theatre, while there seems to be no difference between my European students and my Chinese students in classical styles. This research can benefit from a mixed-method approach. A scientific study can point out if there is a significant difference - it will be interesting to see if the way we acquire different languages plays a part in this - and can look at the tongue-positioning in CCM styles, whereas the qualitative part will focus on the experience of the students, and the awareness of this phenomenon.

4. Conclusion

As seen throughout this paper, the choices of paradigms, research methods and methodologies are plenty, and every choice has its advantages and disadvantages. The task of the researcher is to be able to justify every choice made throughout the research design process (Crotty, 1998).

In this paper, I have tried to make connections between the different research designs and the way I might be able to incorporate them in my future research. As a professional practitioner, who combines voice science with practical experience in the classroom, I tend to lean towards a mixed-method approach in my research, which is strongly associated with the pragmatic paradigm. But, the actual research question will of course be guiding my research design.

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