The DDLR Model of Research Process for Designing Robust and Realizable Research Methodology During Ph.D. Program in India

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Area/Section: Research Methodology.
Type of the Paper: Conceptual Model.
Type of Review: Peer Reviewed as per |C|O|P|E| guidance.
Indexed in: OpenAIRE.
DOI: https://doi.org/10.5281/zenodo.7188001
Google Scholar Citation: IJMTS

How to Cite this Paper:
Ganesha, H. R., & Aithal, P. S., (2022). The DDLR Model of Research Process for Designing Robust and Realizable Research Methodology During Ph.D. Program in India. *International Journal of Management, Technology, and Social Sciences (IJMTS), 7*(2), 401-418. DOI: https://doi.org/10.5281/zenodo.7188001

International Journal of Management, Technology, and Social Sciences (IJMTS)
A Refereed International Journal of Srinivas University, India.

CrossRef DOI: https://doi.org/10.47992/IJMTS.2581.6012.0229

Received on: 10/09/2022
Published on: 12/10/2022

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ABSTRACT

Purpose: *To develop a holistic and comprehensive model of the research process which would help Ph.D. scholars in designing a robust and realizable research methodology during their Ph.D. program.*

Design/Methodology/Approach: *Postmodernism philosophical paradigm; Inductive research approach; Observation data collection method; Longitudinal data collection time frame; Qualitative data analysis.*

Findings/Result: *We determinedly believe that the DDLR model of the research process would cease all the predispositions, misconceptions, and misunderstandings about doctoral-level research and research methodology/design. As long as the Ph.D. scholars can understand all the sixteen steps of the DDLR model and make mindful choices in each step they will be able to convert a complicated Ph.D. journey into an intellectually challenging and interesting journey thereby generating original and significant research outputs.*

Originality/Value: *Of course, we have not invented anything new in the DDLR model. But, for sure we have discovered a systematic way of arranging all the available steps of doing research in a well-thought-through process flow that is appropriate and applicable for scholars admitted to Ph.D. programs across disciplines. In addition, the DDLR model would enable Ph.D. scholars in designing a robust and realizable research methodology. There are several books, materials, blogs, articles, etc that are produced by many authors about research methodology. However, they have attempted to focus on a specific step of the research process. Developing the DDLR model is an attempt to collate all the existing knowledge about research methodology that is useful for Ph.D. scholars (to-be-doctorates).*

Paper Type: *Conceptual model.*

Keywords: Research Methodology; Research Design; Research Process; PhD; Ph.D.; Coursework; Doctoral Research; DDLR Model; Research Onion; Postmodernism; Thesis; Research Article; Research Paper

1. BACKGROUND :

One thing Ph.D. scholars must always remind themselves of throughout their Ph.D. journey is the fact that they will be awarded a Ph.D. degree for doing doctoral-level research. Doing doctoral-level research and generating research outputs such as research articles and a thesis determines the probability of success in getting a Ph.D. degree. It is thus inevitable and imperative that Ph.D. scholars understand doctoral-level research in depth before even starting any of the steps in their Ph.D. journey.

The doctoral-level research which is the single most important requirement of the Ph.D. program is cognitively demanding and intends to create researchers who can create new knowledge or interpret existing knowledge about reality by using different perspectives and philosophical paradigms. Knowledge sharing requires autonomy, quality time, a stress-free brain for deep thinking, and the freedom to look for more meaningful findings. This is the single most important reason for making doctoral-level research flexible wherein the scientific world gives autonomy to Ph.D. scholars to formulate their question and answer it within 3-6 years. Nevertheless, only 50% of scholars admitted to

Ph.D. in India completed, that too in ten years period. Various research studies have identified factors affecting the Ph.D. success rate across the world. To name a few a) scholar-supervisor/guide relationship; b) mentorship; c) dissertation process; d) role of the department; e) role of peer qualities; f) transformational learning experience provided; g) level of curiosity and interest in reviewing the existing literature; h) planning and time management skills; i) level of creative thinking and writing skills; j) amount of freedom in the research project; k) level of a supportive environment for Ph.D. scholars' well-being; l) higher-education practices; m) supervisors' research capabilities and gender; n) expectations set by the research environment; o) Ph.D. scholars' expectations; p) support network; q) level of Ph.D. scholars' socialization with the research community; r) Ph.D. scholars' navigation system [1-45].

In addition to these factors available in the existing literature, another important aspect of such a low success rate is attributed to various complications that are sown by the research education system in India. Of which the key reasons are i) different terminologies for various components of doctoral-level research are given by different disciplines creating undue confusion in scholars' minds and ii) data collection methods which just play the role of data collection and it is just one of the steps of the doctoral-level research process being portrayed as the research methodology/design [46].

In reality, a majority of stakeholders in the research education system have a lower level of clarity about the step-by-step doctoral-level research process that is standard across disciplines. This lower level of clarity and a misconception that doctoral-level research is different for different disciplines is making it difficult for Ph.D. scholars to design a robust and realizable research methodology/design. We believe that a Ph.D. program is one of the easiest degree programs in the world with the highest level of autonomy bestowed on Ph.D. scholars. But this reality is knowingly or unknowingly, intentionally, or unintentionally suppressed by a majority of stakeholders in the research education system in India. In other words, this *suppressed reality* has resulted in creating humungous confusion about doctoral-level research methodology/design among Ph.D. scholars in India.

2. OBJECTIVE :

There is a vast literature about the doctoral-level research process. In reality, Ph.D. scholars get confused with various terminologies about different types of research viz., descriptive research; exploratory research; analytical research; explanatory research; confirmatory research; basic research; applied research; qualitative research; quantitative research; empirical research; experimental research; primary research; secondary research; doctrinal research; non-doctrinal research and so on. Ph.D. scholars cannot avoid focussing on these terminologies as different institutes/universities/research supervisors/guides/mentors and the entire research education system in India use these different terminologies under different circumstances/contexts unknown to Ph.D. scholars. We determinedly believe that all these terminologies are related to either stages/phases or the levels of knowledge creation/development/modification in a chosen area of research and the standard research process remains the same for all the disciplines. The only change is the acceptable limits set at each stage of the research process by each discipline are different. To eradicate such humungous confusion among Ph.D. scholars across disciplines, *we intend to develop a holistic and comprehensive model of the research process which would help Ph.D. scholars in designing a robust and realizable research methodology*.

3. THE DDLR MODEL OF THE RESEARCH PROCESS :

We believe that the 'Research Onion' model [47] has only six layers and explaining just these six levels might not be helpful, especially for Ph.D. scholars across all disciplines [48]. However, the model gives us a foundation to extend the same further at each of these six levels and beyond. Based on our experience in research, teaching, and guiding research scholars in India and to avoid all these confusions we have designed 16 steps doctoral-level research process which is named as DDLR (Doing Doctoral-level Research) Model. The DDLR model is illustrated in figure 1.

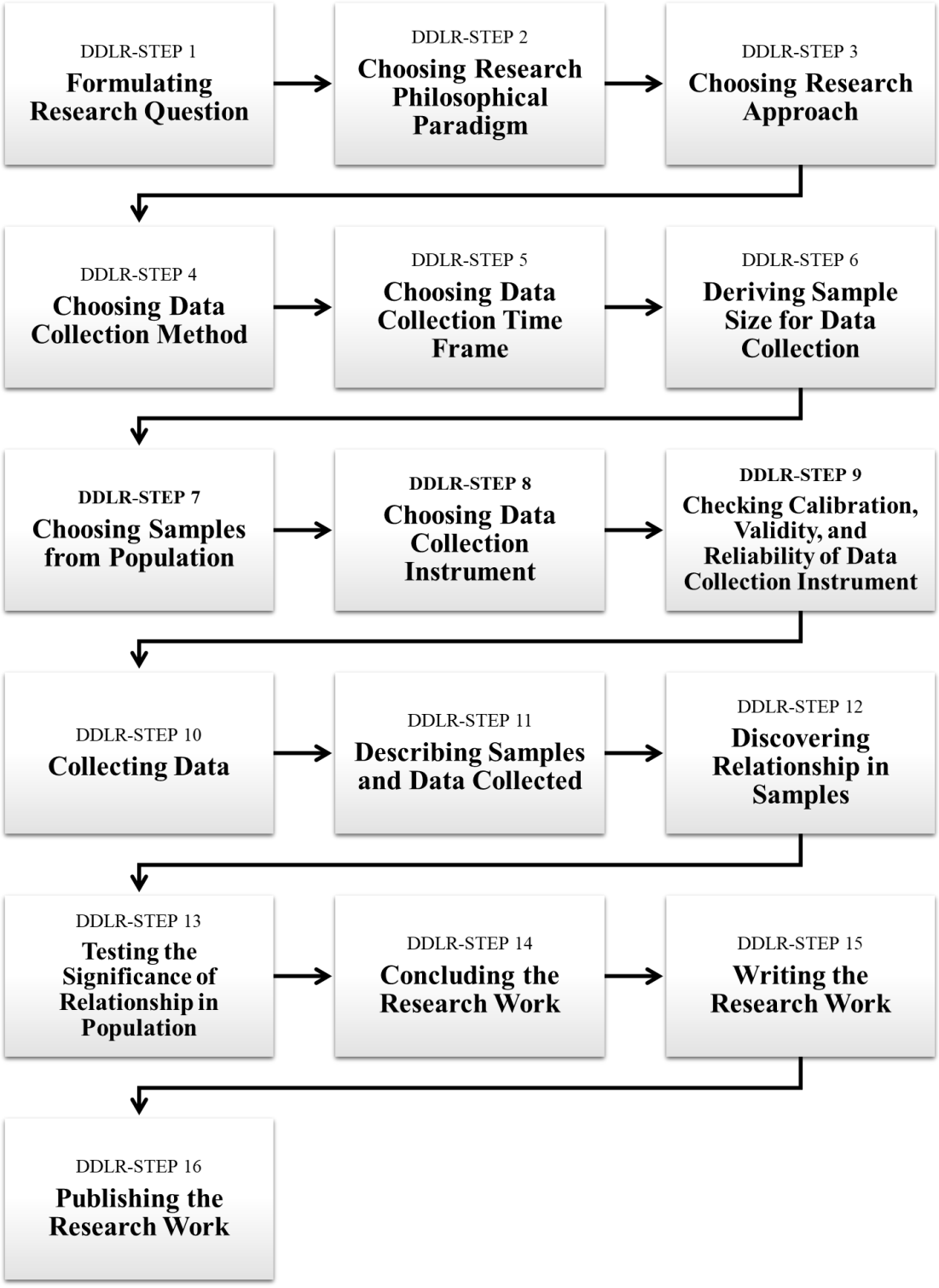

Fig. 1: The DDLR model of the research process

We recommend Ph.D. scholars follow each step of the DDLR model to simplify their Ph.D. journey. Under any circumstances/contexts, they are suggested not to skip any of these steps. Of course, we have not invented anything new in the DDLR model. But, for sure we have discovered a systematic way of arranging all the available steps of doing research in a well-thought-through process flow that is appropriate and applicable for scholars admitted to Ph.D. programs across any discipline. In addition, the DDLR model would enable Ph.D. scholars in designing a robust and realizable research methodology. There are several books, materials, blogs, articles, etc that are produced by many authors about research methodology. However, they have attempted to focus on a specific step of the research

process. Developing the DDLR model is an attempt to collate all the existing knowledge about research methodology that is useful for Ph.D. scholars (to-be-doctorates). If the Ph.D. scholars can understand and follow every step of the DDLR model, they will be able to complete their Ph.D. program without any complications and with great joy.

4. STEPS IN DDLR MODEL :

In addition to shedding light on all the sixteen steps, a closer look at each of them reveals how the DDLR model functions as a whole.

4.1. DDLR Step 1 – Formulating Research Question:

A majority of research scholars (including a few ones who have completed their Ph.D.) have a predisposition in their minds that a 'Research Question' and 'Research Topic' are the same. We strongly recommend Ph.D. scholars come out of this false assumption. The research topic is a result of an effort to convert a complicated research question into an understandable, appealing, persuasive, and most importantly generalizable title for a research article or thesis. We suggest scholars convert their research question into a research topic only after the successful completion of step 1 of the DDLR model. *A research question is a question that is yet to be answered or an answer that is yet to tested or verified*. A good research question seeks to improve knowledge about a fact/phenomenon /reality/truth/effect/dependent variable/outcome variable, and it is usually narrow and specific. Step 1 is the most significant step of the DDLR model and the Ph.D. journey. If the key objective of a Ph.D. scholar is to complete their Ph.D. in time and without any complications then they have to spend a significant amount of time framing/formulating the research question. Charles Kettering's quote *"A Problem Well Stated is Half Solved"* suits this context. A research question well formulated is half answered and most importantly the moment scholars formulate their research question 50% of their Ph.D. journey is complete. Formulating a research question is also a structured process and must follow the steps listed below.

(1) Identifying a Fact/Phenomenon/Reality/Truth/Effect/Dependent variable/Outcome variable/Endogenous variable based on Ph.D. scholars' genuine interest.
(2) Identifying Factors/Cause/Independent variables/ Input variables/exogenous variables based on a preliminary literature review and Ph.D. scholars' genuine interest.
(3) Identifying a research gap through a detailed literature review (mega literature review).
(4) Defining research questions (descriptive or relational or causal) based on Ph.D. scholars' competence and their research environment.
(5) Refining the research question to achieve a manageable focus.

Ph.D. scholars are recommended to dedicate at least one year of their Ph.D. journey to step 1 of the DDLR model i.e., formulating a research question. Many times, scholars are tempted to choose a research question/problem based on trending topics or their research supervisor/guide's interest, or their institute's research area of interest. It is fine to go with this option as long as scholars have verified the credibility of such a research question/problem by performing the preliminary and mega literature review tasks themselves. By any chance whatsoever if Ph.D. scholars miss this step then the probability of completing their Ph.D. program is very low.

4.2. DDLR Step – Choosing Research Philosophical Paradigm:

The second step of the DDLR model is choosing a research philosophical paradigm. We are sure many Ph.D. scholars might think about wherefrom this philosophy entered the research process. They might also wonder why the term Doctor is part of their degree because most of them think that a Doctor is a Medical Practitioner. Ph.D. scholars must be mindful of the fact that they have joined a degree program that is abbreviated as Ph.D. This abbreviation has two components in it. Doctor and Philosophy. The meaning of a doctor is not a medical practitioner. In the olden days, medical practitioners were known as Physicians/Surgeons. Somehow the prefix Dr. and the name Doctor got attached to Physicians/Surgeons by dominant power relations. However, In Latin the meaning of doctor is 'To Teach' and the meaning of doctorate is 'I Teach'. "Dr" or "Dr.", is used as a designation for a person who has obtained a doctorate. In many parts of the world, it is also used by medical practitioners, regardless of whether they hold a doctoral-level degree. In Greek, the meaning of Philosophia is 'Love of Wisdom' or 'Pursuit of Knowledge' or 'A System of Thought'. Philosophy means, studying

fundamental and general questions about a) mind; b) language; c) values; d) knowledge; e) reasoning; f) existence; g) reality. The practitioners of philosophy were known as Philosophers till the 19th century and now they are known as Researchers. Philosophy plays an important role in a) critical thinking; b) deeper reflection about concepts, methods of inquiry, value claims, and other perspectives; c) imparting knowledge about rigorous analysis, sound argument, critical examination, consistent thoughts, systematic thoughts, and writing skills. This is the single most reason why Ph.D. scholars need to understand the importance of step 2, check for available research philosophical paradigms and choose the one which is appropriate to answer their research question formulated in step 1. There are many philosophical paradigms. A few of them are listed below.

(1) Positivism/Objectivism – Objectively reflecting on reality.
(2) Interpretivism/Subjectivism – Subjectively reflecting on reality.
(3) Critical Realism – Distinguishing between the real and observable.
(4) Postmodernism – Challenging knowledge claims.
(5) Pragmatism/Mixed – What works is reality. Not committed to or limited by one specific philosophy.

Ph.D. scholars should be aware that a Ph.D. holder is the one who can teach (the real meaning of Doctor) the pursuit of knowledge (the real meaning of Philosophy). A teacher without a Ph.D. can only teach what is written in a textbook (existing knowledge claims) and/or based on his or her own experiences. This does not mean that Teachers without a Ph.D. degree are not capable of teaching the pursuit of knowledge, there are a few Teachers better than many Ph.D. holders, but the number of such Teachers is very low.

4.3. DDLR Step 3 – Choosing Research Approach:

The research approach is a way of reasoning about the relationship between the dependent (fact) and independent variables (factors) of the research question. Reasoning, on the other hand, is limited to the conscious production of thought with the use of logic, it is the act of moving toward an understanding of the relationship between variables of a research question. The research approach is also about deciding whether to i) build/construct a new theory about a relationship; ii) test/verify an existing theory about a relationship; iii) deconstruct/modify/rationalize a theory about the relationship. The theory is a statement about the relationship between dependent and independent variables limited to a specific context and units of analysis. However, such a statement is a result of many hypotheses tested enough times that we can make a general rule that accounts for the dependent variable (fact).

Step 2 of the DDLR model is the base for Ph.D. scholars to choose a research approach in step 3 as the research philosophical paradigm they have chosen in step 2 is the key driver for the selection of a research approach. There are three main types of research approaches listed below.

(1) Deductive approach (testing an existing theory)
(2) Inductive approach (constructing a new theory)
(3) Abductive approach (deconstructing/modifying/rationalizing a theory)

Before choosing any one of these research approaches, the Ph.D. scholars must understand each one of them in-depth, especially concerning the research duration required by each of these approaches.

4.4. DDLR Step 4 – Choosing Data Collection Method:

Data in Greek is ‘to give’/‘given’. It belongs to the family of information, knowledge, and wisdom. Data can be in the form of numbers, words, images, ideas, preferences, opinions, perspectives, behaviors, and attitudes. Data is the lowest unit of information from which other measurements and analyses are done. Data comes from observations made upon variables of a research question. There are two types of data viz., a) primary data, which is original, authentic, reliable, objective, valid, and most importantly unpublished before, and b) secondary data which is already published by other researchers or agencies that are open for all to access. Ph.D. scholars are required to use primary data to conclude their research. However, concluding the research using just the secondary data is also possible as long as their research findings are original and contribute to creating new knowledge or interpreting the existing knowledge in a completely different way.

The data collection method (also known as a research method and misinterpreted as research methodology by a majority of researchers) is a strategy that is a long-term, actionable, practical, and competitive path, chosen for achieving key research objectives. It is a higher level of decision-making

in the Ph.D. journey that determines the repeatability of scholars' research results which is a measure of the ability of the data collection method to generate similar results for multiple preparations of the same sample. It is a scientific/systematic/scholarly way of collecting data from the units of analysis/samples to answer the research question. An appropriate data collection method depends upon a) type of research question; b) research philosophical paradigm choice; c) research approach choice; d) time and resources available for data collection; e) Ph.D. scholars' competence. Choosing one among many data collection methods is one of the important decisions scholars need to make during their Ph.D. journey. We have come across many ways of grouping the available data collection methods in textbooks and literature which is also one of the reasons for creating confusion among Ph.D. scholars. But we have made two important groups of data collection methods available for Ph.D. scholars to choose as listed below.

- *Noninteractive* data collection methods wherein there is no or minimal interaction between researcher and units of analysis/samples/respondents/subjects/groups.
    - Archival
    - Observation
    - Meta-analysis
- *Interactive* data collection methods wherein there is an interaction between the researcher and units of analysis/samples/respondents/subjects/groups.
    - Focus Group Discussion
    - Action Research
    - Ethnography
    - Grounded Theory
    - Case Study
    - Phenomenology
    - Survey
    - Experiment

Before choosing any one of these data collection methods, Ph.D. scholars must understand each one of them in-depth, especially concerning the research duration required by each of these data collection method. We strongly recommend they must know their competence, time, and resources available for them to collect data, and most importantly their research environment before finalizing a data collection method in step 4 of the DDLR model. There are three scholarly ways of choosing the best primary data collection method listed below [47].

(1) *Mono-method Choice* - Using just a single method of data collection to answer a research question is known as the mono-method choice. In this type, Ph.D. scholars will be choosing any one of the eleven primary data collection methods.

(2) *Mixed-method Choice* - The use of two or more primary data collection methods *simultaneously/concurrently* to answer one research question is known as a mixed-method choice. Here the combined methodology generates *one data set* and most importantly the data collection period shall be the same.

(3) *Multi-method Choice* - In this type, a wider selection of primary data collection methods is used to answer just one research question. Here the Ph.D. scholars will be dividing their research into separate segments/stages/phases, with each *sequentially* producing a specific dataset, and the data is collected in different collection periods. Simply put, scholars would want to collect data using different primary data collection methods sequentially to be able to confidently claim their research findings.

We cannot rank the above three method choices in any order of preferences. All of them have their merits and demerits. However, the quality of a Ph.D. thesis is determined by the type of primary data collection method choice a scholar has made. What is important is the level of evidence that is required to defend/justify Ph.D. scholars' hypotheses/logical assumptions and research findings. In addition to the level of confidence, other factors that play an important role in choosing one of these methods choices are the level of authenticity, validity, reliability, and generalizability required to claim their research findings.

4.5. DDLR Step 5 – Choosing Data Collection Time Frame:

The primary data collection methods tell us 'how' to collect data and once the Ph.D. scholars have

chosen this 'how', now in step 5 of the DDLR model they need to decide 'when' to collect the primary data using the data collection method choices chosen by them in step 4. There are two main types of time frames available to collect the primary data to answer a research question listed below.

(1) Cross-sectional time frame (data are gathered just once). Collecting data from many different respondents/subjects/participants/units of analysis/samples/individuals/groups at a single point time (just one-time).
(2) Longitudinal time frame (data are gathered over a period). Collecting data about the same variables/respondents/subjects/participants/units of analysis/samples/individuals/groups several times continuously over a period through repeated observations. A longitudinal time frame of data collection can be achieved in three different ways viz., a) panel study; b) cohort study; c) retrospective study.

We cannot rank the above time frames of data collection in any order of preferences. Both of them have their merits and demerits. However, the quality of a Ph.D. thesis is determined by the type of primary data collection time frame choice a scholar has made. What is important is the level of evidence that is required to defend/justify Ph.D. scholars' hypotheses and research findings. In addition to the level of confidence, other factors that play an important role in choosing one of these methods choices are the level of authenticity, validity, reliability, and generalizability required to claim their research findings.

4.6. DDLR Step 6 – Deriving Sample Size for Data Collection:

In step 4 and step 5 of the DDLR model Ph.D. scholars have chosen 'how' and 'when' to collect primary data respectively. Now in step 6, scholars need to finalize 'from how many' respondents/participants/ subjects/cases/groups/units of analysis/samples they require to collect the primary data. Step 6 is one of the easiest steps during the Ph.D. journey as the scholars will get the help of a 'facilitator' famously known as statistical techniques.

Ph.D. scholars must be aware that they are interested in studying a population/universe/group but unfortunately, it is impossible to collect primary data from the entire population of the research question. Statistical techniques help to scientifically arrive at an ideal sample size for collecting data and the only way to avoid statistics during step 6 is to collect data from the entire population (known as Census). However, statistical techniques can only help derive the sample size through standard formulas, but scholars need to know/decide on a few components of these formulas listed below.

- Decision 1 – Population size
- Decision 2 – Sample Proportion
- Decision 3 - Margin of Error and Confidence Interval
- Decision 4 – Confidence Level

Once all the above four decisions are made, then actually the work of scholars is done. Now they need to enter the numbers of all these decisions into the standard sample size formula to derive the sample size for the primary data collection. There are two standard formulas for calculating the sample size suggested by William Gemmell Cochran [49] such as,

i. Formula 1 – When the scholars know the exact size of the population of their research question.
ii. Formula 2 - When the scholars do not know the exact size of the population of their research question.

Upon deriving the sample size, set the final sample size as 20% higher than what is derived using the formula. The additional samples are recommended as there are chances that the samples chosen might not respond to or they might answer a few questions without much deliberation, or they might not turn up during the data collection process.

4.7. DDLR Step 7 – Choosing Samples from Population:

In step 4, step 5, and step 6 of the DDLR model Ph.D. scholars have chosen 'how ', 'when', and 'from how many' to collect primary data respectively. Now in step 7, they need to finalize 'from whom' (respondents/participants/subjects/cases/groups/units of analysis/samples) to collect the primary data that are representing the population of the research question. Step 7 is also one of the easiest steps during the Ph.D. journey as the task is to only choose one of the nine available techniques. Choosing the right samples from the population is also known as the sampling/sampling technique. Though the procedure of selecting a sample differs according to the type of sample selected, certain fundamental rules remain the same that are listed below.

- The group or universe or population must be defined precisely.
- Before choosing the sample, the unit of analysis/sample should be defined precisely. A clear description of the sample based on the research question is mandatory.
- The appropriate source list which contains the names of units of a group or universe or population from which the sample is to be selected should be prepared beforehand in case it does not already exist.
- The size of the sample to be selected should be pre-determined as explained in step 6.

A few available sampling techniques are listed below.

i. Non-random/Non-probability sampling
   a. Judgemental/Purposive sampling
   b. Quota/Dimensional sampling
   c. Convenience sampling
   d. Snowball sampling

ii. Random/Probability sampling
   a. Simple random sampling
   b. Systematic sampling
   c. Stratified sampling
   d. Cluster/Area sampling
   e. Multi-stage sampling

4.8. DDLR Step 8 – Choosing Data Collection Instrument:

In step 4, step 5, step 6, and step 7 of the DDLR model Ph.D. scholars have chosen 'how', 'when', 'from how many', and 'from whom' to collect primary data respectively. Now in step 8, they need to finalize 'using which instrument' they will collect the primary data from the samples they have chosen from the population of their research question. Step 8 is also one of the easiest steps during the Ph.D. journey as the scholars' task is to only choose one or more data collection instruments from many available. There are four main categories of data collection instruments in research listed below.

(1) Mechanical instruments
(2) Electrical instruments
(3) Electronic instruments
(4) Human instruments

It is easier to select a Mechanical, Electrical, or Electronic Instrument. However, it is difficult to select a Human Instrument. Scholars are allowed to choose any one of the following ways of finalizing a Human instrument for primary data collection as detailed below.

- *Adoption* - In situations when there are existing Human instruments that are appropriate to measure variables then taking all the questions/items from an existing instrument is allowed and this is known as adoption. Scholars are not allowed to change any questions/items, and this is feasible only when the context/environment of the research study is the same.
- *Adaption* - Taking most of the questions/items from an existing/proven/reliable Human instrument is known as adaptation. Scholars are allowed to make changes to a few existing questions/items to make them appropriate and match the context/environment of their research question.
- *Development* - In situations wherein, scholars are unable to adopt or adapt an existing Human instrument then creating/developing a new Human instrument with all the questions/items in it being new is the right way and this is known as development. The only chance for Ph.D. scholars of Social Sciences, Economics, Management, and disciplines other than Basic Sciences, Engineering, and Technology to own a Patent is to develop a new Human instrument.

4.9. DDLR Step 9 – Checking Calibration, Validity, and Reliability of Data Collection Instrument:

Once the Ph.D. scholars have chosen 'how', 'when', 'from how many', 'from whom', and 'using which instrument' to collect the primary data in steps 4, 5, 6, 7, and 8 of the DDLR model respectively now before collecting the data they need to check the calibration, validity, and reliability of the data collection instrument they have chosen in step 9 of the DDLR model. Reliability and validity of the data collection instrument are concepts used to evaluate the quality of research. They indicate how well

a method, technique, or test (instrument) measures something. Calibration defines the accuracy and quality of measurements recorded using a piece of Mechanical, Electrical, or Electronic instrument, reliability is about the consistency of a measure, and validity is about the accuracy of a measure.
A measuring device should be calibrated i) according to the recommendation of the manufacturer of the device, ii) after any mechanical or electrical shock, and iii) periodically (annually, quarterly, monthly).
There are four steps to check the validity of a human instrument viz., i) face validity; ii) construct validity; iii) content validity; iv) criterion validity. Ph.D. scholars need to be aware that all these steps are mandatory in case they have chosen a Human instrument that is either 'adapted' or 'developed'. In case they have decided to 'adopt' an existing Human instrument then checking the validity of the instrument is not required.
There are five steps to check the reliability of data collection when using Human instruments viz., i) test-retest (this is also required for Mechanical, Electrical, or Electronic instruments); ii) parallel forms; iii) inter-rater; iv) split-half; v) internal consistency. Scholars need to be aware that all these steps are mandatory irrespective of the type of Human instrument they have chosen in the previous step ('adopted', 'adapted', and 'developed').
It is very important to ensure mentioning the results of the calibration, validity, and reliability of the data collection instrument in a majority of sections of a research article and Ph.D. thesis.

4.10. DDLR Step 10 – Collecting Data:

Only when the scholars have chosen 'how', 'when', 'from how many', 'from whom', and 'using which instrument' to collect the primary data in steps 4, 5, 6, 7, and 8 respectively and checked the calibration, validity, and reliability of the data collection instrument in step 9 of the DDLR model, they can now go ahead and collect data from respondents/participants/subjects/groups/units of analysis/samples that they have chosen from the population of their research using a particular sampling technique. They need to know that step 10 of the DDLR model is the most important step that determines the authenticity, originality, reliability, validity, generalizability, and overall quality of their Ph.D. thesis and research articles. They need to ensure they give utmost importance to this step. We strongly recommend scholars consider the following points while collecting the data to answer their research question.

- What data is needed? Make sure collecting information/data is strictly limited to the research question.
- Ensuring they are well aware of the units of analysis/samples, independent variables, and dependent variables of their research question, and collecting data mostly concerning these three components of the research question.
- What is the type/characteristic of data that is available/accessible to scholars? There are two main types of data.
    - Categorical (qualitative) such as nominal/unordered or ordinal/ordered/scale.
    - Numerical (quantitative) such as discrete/counts or continuous.
- What information/data will be useful?
- Taking required permissions before collecting information/data from respondents/participants / subjects/groups/units of analysis/samples and other concerned authorities.
- Avoiding sharing the confidential information/data collected with anyone else.
- The data must be cleaned up and organized in a way that will allow for statistical analysis. The collected data must be scrutinized with a keen eye to make sure there are no mistakes or omissions.
- Avoiding sharing of collected information/data using unreliable media.
- Storing the collected information/data in multiple locations as a backup.

Once all the above are taken care of, scholars need to also consider errors that ought to happen while collecting the data. Errors are not always due to mistakes. There are two types of errors i) random error and ii) systematic error.

4.11. DDLR Step 11 – Describing Samples and Data Collected:

Once the data collection is completed. Now in Step 11 of the DDLR model, Ph.D. scholars need to describe the data they have collected related to respondents/participants/subjects/groups/units of analysis/samples and other variables of their research question. It is imperative to describe the samples and data only using the statistical techniques listed below.

- Measures of central tendency
  - Mean
  - Median
  - Mode
  - Skewness
  - Kurtosis
- Measures of dispersion
  - Range
  - Standard deviation
  - Coefficient of variance

4.12. DDLR Step 12 – Discovering Relationship:

Once the scholars have understood the entire data collected about respondents /participants/subjects/groups/units of analysis/samples, independent variables, and dependent variables of their research question with the help of measures of central tendency and measures of dispersion they are now ready for discovering the relationship among variables of their research question which was the main goal of scholarly research during the Ph.D. program. In step 12 of the DDLR model, scholars are now required to discover this relationship with the help of statistical techniques. Scholars must be aware that knowing the relationship between/among variables of their research question is the key objective. Only when they know the relationship they will be able to solve the research problem or answer the research question scientifically/scholarly. There are majorly three types of relationships listed below.

- Association - In the case of an association, scholars study the relationship between two attributes that are not measurable quantitatively.
- Correlation - In the case of correlation analysis, scholars will be able to understand the relationship between two variables, which they can measure quantitatively.
- Causation - A causal relationship exists when one variable in a data set influences another variable. Thus, one event triggers the occurrence of another event. A causal relationship is also referred to as a cause-and-effect relationship.

Association is used for variables that are not quantitatively measurable. The presence of a correlation is not sufficient to infer the presence of a causal relationship. While causation and correlation can exist at the same time, correlation does not imply causation. Correlation is always two ways, whereas a causal relationship, by definition, is one-way.

4.13. DDLR Step 13 – Testing the Significance of Relationship:

Ph.D. scholars might think that what is left after all once they have discovered a relationship among variables of their research question in step 12 of the DDLR model. It is important to note that the scholarly research is not yet complete. There are a few more steps. If scholars had collected a census of the entire population, the job is done after discovering the relationship in step 12. However, scholars should be cognizant of the fact that they have collected data from a few select units of analysis/samples of the population of their research which means they cannot claim the relationship discovered in the samples to be existing in the population also. In step 13 of the DDLR model, scholars need to now estimate the likelihood of the statistic they observed in the units of analysis/samples, being the same as the 'real' parameter in the population. Step 13 is commonly known as the test of significance/hypothesis testing/inferential statistics. By performing the test of significance scholars will now be able to estimate the relationship among variables of their research question to the entire population of their research.

The key goal is to use a small sample of data to infer about a larger population. The goal of statistical modeling itself is all about using a small amount of information to extrapolate and generalize information to a larger group (population). As mentioned in step 7, the accuracy of inference depends heavily on the sampling technique chosen, and if the sample is not a good representative of the population, the generalization will be inaccurate. The test of significance or hypothesis test is a step-by-step process. There are four key steps listed below.

- Step 1: Stating the research hypothesis (researcher hypothesis/alternate hypothesis).
- Step 2: Stating the null hypothesis.
- Step 3: Selection of a probability of error level i.e., significance level (alpha).

- Step 4: Selection of an appropriate significance test to compute the value of the test statistic; comparing the test statistic with the standard critical value and making a final decision/conclusion/ claim about the existence of relationship among variables in the population.

4.14. DDLR Step 14 – Concluding Research Work:

Surprisingly a majority of research work is completed by the time scholars complete step 13 of the DDLR model. However, the last three steps of the DDLR model are crucial because these steps determine how well you have conducted research and how good you are at narrating your research story to the entire scientific community/scholarly world. We have deliberately created step 14 which is related to some rules and regulations about concluding, interpreting, and representing the research work. This step has to be done very carefully, otherwise, misleading conclusions may be drawn and the whole purpose of doing research may get vitiated. It is only through interpretation that you can expose relations and processes that underlie research findings. The task of interpretation is not an easy job, rather it requires great skill and dexterity on the Ph.D. scholars' part. Interpretation is an art that one learns through practice and experience and one of the best ways to learn is by reading others' research articles and theses. Scholars must always remember that despite collecting the correct data and doing a proper analysis, the wrong interpretation would lead to inaccurate conclusions. The task of interpretation must be accomplished with patience, impartiality, and also in the correct perspective. Scholars are recommended to understand the Ph.D. regulations of their University/Institute to ensure representation of tables, figures, illustrations, schematic diagrams, equations/formulas, process flows, font, font size, color, margins, spacing, etc., are aligned to the regulations.

4.15. DDLR Step 15 – Writing Research Work:

Once the research is concluded in step 14, now scholars are ready for writing their research work which is step 15 of the DDLR model whether in the form of a research article or Ph.D. thesis. However, it is not that easy as the same requires not just basic writing skills but in addition, scholars also need to understand research writing skills. If scholars do not have such writing skills, we recommend they look at the way other researchers have written their articles or theses at the time of literature review (step 1 of the DDLR model). In general, any research writing must include the following sections.

- Section 1 – Introduction/Background
- Section 2 – Review of existing literature
- Section 3 – Need for the study
- Section 4 – Research objectives
- Section 5 – Hypotheses (if any)
- Section 6 – Research Methodology/Design
- Section 7 – Analysis, Results, and Findings
- Section 8 – Discussion and Conclusion
- Section 9 – Suggestions
- Section 10 – Limitations of research
- Section 11 – Acknowledgments (if any)
- Section 12 – References of cited works

4.16. DDLR Step 16 – Publishing Research Work:

Ph.D. scholars might now be thinking that what is still left after they have completed the writing part of the research work. The key goal of a Ph.D. scholar is to share the new knowledge discovered with the entire scientific community. To achieve this, they need to understand step 16 of the DDLR model named publishing research work. This is of course the last step of the DDLR model. Furthermore, we recommend scholars seamlessly integrate coursework, area of interest, research question, Ph.D., and career plan with the publication target. Irrespective of the University's regulations about publications during Ph.D., we strongly recommend scholars encash various opportunities they are given during their Ph.D. journey to publishing research work. A few such opportunities are listed below.

- Publishing a literature review article after formulating the research question.
- Publishing descriptive articles about all the variables of the research question.

- Publishing about the relationship discovered between variables of the research question.

Even after publishing the Ph.D. journey is not complete yet. Scholars must ensure they understand various intellectual property rights (Copyrights, Patents, and Trade Marks) and they must attempt to generate a few IPRs during their Ph.D. Another important consideration is scholars must also understand ways to publicize their research work through various research community networks. A few of them are listed below.

- ORCID (Open Researcher and Contributor ID)
- UGC Vidwan
- UGC Shodh Chakra
- Google Scholar
- SSRN
- Research Gate
- Academia
- Microsoft Academic
- Scopus
- Web of Science
- BASE
- PubMed Central
- Lexis Web

5. CONCLUSION :

There are many misconceptions about research methodology among Ph.D. scholars across disciplines. To name a few a) research question and research topic are the same; b) adopting philosophical paradigms commonly followed by a discipline is mandatory; c) adopting research methodology commonly followed by a discipline is mandatory; d) data collection method is research methodology/design; e) data collection time frame is research methodology/design; f) qualitative research is easier than quantitative research; g) statistics is the major part of research; h) secondary data cannot generate original research output [46] [48] [50]. An in-depth investigation of the causes of the misconceptions can involve academics in research curriculum reform initiatives to support the cross-curricular development of research competencies. On one level, Ph.D. scholars' misconceptions serve as a diagnostic tool to assist the research supervisors/guides in correcting scholars' flawed thinking about research methodology/design. Reform in doctoral-level research programs, especially the coursework stage of the program should encourage a scholar-centered systemic approach to formative improvements rather than promoting the boundaries between different types of research, hence enhancing cohesiveness across all types of research methods [51-71].

There is a vast literature about the doctoral-level research process. Surprisingly, Ph.D. scholars get confused with various terminologies about different types of research viz., descriptive research; exploratory research; analytical research; explanatory research; confirmatory research; basic research; applied research; qualitative research; quantitative research; empirical research; experimental research; primary research; secondary research; doctrinal research; non-doctrinal research and so on. We determinedly believe that all these terminologies are related to either stages/phases or the levels of knowledge creation/development/modification/rationalization in a chosen area of research (fact/phenomenon/truth/reality/effect/dependent variable). The reality is a majority of stakeholders in the research education system have a lower level of clarity about this predisposition. This lower level of clarity is resulting in designing unrealizable research methodologies by a majority of Ph.D. scholars in India. Ph.D. scholars must avoid focussing on these terminologies and just understand the scientific and scholarly way of researching.

It is the responsibility of every stakeholder in the research environment and system to ensure that the scholars are made aware of such predispositions and are enlightened about every step of the doctoral-level research process. Designing robust coursework that is intended to build confidence in carrying out high-quality research is an appropriate way of fulfilling this responsibility. In addition, scholars must understand that doctoral-level research is a step-by-step process and most importantly it remains the same for all disciplines. The only change is the acceptable standards set at each stage of the research process by each discipline are different. We determinedly believe that the DDLR model of the research process would cease all these predispositions, misconceptions, and misunderstandings about doctoral-

level research and research methodology/design. As long as the Ph.D. scholars can understand all the sixteen steps and make mindful choices in each step they will be able to convert a complicated Ph.D. journey into an intellectually challenging and interesting journey thereby generating original and significant research outputs.

Finally, Ph.D. scholars must know that the real meaning of research methodology/design is the overall combination of all the choices they make from step 1 to step 10 of the DDLR model. Steps 11 to 16 are just an outcome of choices made in steps 1 to 10. Among all the sixteen steps of the DDLR model, step 1 *(key input in the research process)* plays an important role which in other words is a result of scholars' genuine interest in a fact/phenomenon/reality/truth/dependent variable, intensive review of existing literature, locating an important research gap, and finally formulating a research question. Scholars must note that all the other fifteen steps are to be used to just answer the research question which is formulated by them during step 1 and most importantly the entire research environment/system must guide the scholars in answering the research question. *The probability of completing the Ph.D. program without complications is higher if step 1 of the DDLR model is accomplished with a higher level of focus and interest by the scholar*. Because, if a scholar can complete the formulation of the research question then he/she will have a higher level of visibility about the choices to be made in the succeeding steps which will enable the scholar to design a robust and realizable research methodology to fulfill the key requirement of the Ph.D. program i.e., doing doctoral-level research.

REFERENCES :

[1] Titus, S. L., & Ballou, J. M. (2013). Faculty members' perceptions of advising versus mentoring: Does the name matter?. *Science and Engineering ethics*, *19*(3), 1267-1281. Google Scholar↗

[2] Ali, A., & Kohun, F. (2006). Dealing with isolation feelings in IS doctoral programs. *International Journal of Doctoral Studies*, *1*(1), 21-33. Google Scholar↗

[3] Ali, A., Kohun, F., & Levy, Y. (2007). Dealing with Social Isolation to Minimize Doctoral Attrition- A Four Stage Framework. *International Journal of Doctoral Studies*, *2*(1), 33-49. Google Scholar↗

[4] Spaulding, L. S., & Rockinson-Szapkiw, A. (2012). Hearing their voices: Factors doctoral candidates attribute to their persistence. *International Journal of Doctoral Studies*, *7*, 199. Google Scholar↗

[5] Golde, C. M., & Dore, T. M. (2001). At cross purposes: What the experiences of today's doctoral students reveal about doctoral education, *ERIC Processing and Reference Facility*, 1-62. Google Scholar↗

[6] Golde, C. M. (2005). The role of the department and discipline in doctoral student attrition: Lessons from four departments. *The Journal of Higher Education*, *76*(6), 669-700. Google Scholar↗

[7] Golde, C. M., & Walker, G. E. (Eds.). (2006). *Envisioning the future of doctoral education: Preparing stewards of the discipline-Carnegie essays on the doctorate* (Vol. 3). John Wiley & Sons. Google Scholar↗

[8] Gardner, S. K. (2009). Student and faculty attributions of attrition in high and low-completing doctoral programs in the United States. *Higher education*, *58*(1), 97-112. Google Scholar↗

[9] Gardner, S. K. (2010). Faculty perspectives on doctoral student socialization in five disciplines. *International Journal of Doctoral Studies*, *5*(1), 39-53. Google Scholar↗

[10] Solmon, M. A. (2009). How do doctoral candidates learn to be researchers? Developing research training programs in kinesiology departments. *Quest*, *61*(1), 74-83. Google Scholar↗

[11] Nogueira-Martins, L. A., Fagnani Neto, R., Macedo, P. C. M., Citero, V. D. A., & Mari, J. D. J. (2004). The mental health of graduate students at the Federal University of São Paulo: a preliminary report. *Brazilian Journal of Medical and Biological Research*, *37*(10), 1519-1524. Google Scholar↗

[12] Knox, S., Schlosser, L. Z., Pruitt, N. T., & Hill, C. E. (2006). A qualitative examination of graduate advising relationships: The advisor perspective. *The Counseling Psychologist*, *34*(4), 489-518.

Google Scholar↗

[13] Grady, R. K., La Touche, R., Oslawski-Lopez, J., Powers, A., & Simacek, K. (2014). Betwixt and between: The social position and stress experiences of graduate students. *Teaching Sociology*, *42*(1), 5-16. Google Scholar↗

[14] Russell, J., Gaudreault, K. L., & Richards, K. A. R. (2016). Doctoral student socialization: Educating stewards of the physical education profession. *Quest*, *68*(4), 439-456. Google Scholar↗

[15] Russell, J. A. (2015). Rolling with the punches: Examining the socialization experiences of kinesiology doctoral students. *Research quarterly for exercise and sport*, *86*(2), 140-151. Google Scholar↗

[16] Harding-DeKam, J. L., Hamilton, B., & Loyd, S. (2012). The hidden curriculum of doctoral advising. *NACADA Journal*, *32*(2), 5-16. Google Scholar↗

[17] Mansson, D. H., & Myers, S. A. (2012). Using mentoring enactment theory to explore the doctoral student–advisor mentoring relationship. *Communication Education*, *61*(4), 309-334. Google Scholar↗

[18] Robinson, E. M., & Tagher, C. G. (2017). The companion dissertation: Enriching the doctoral experience. *Journal of Nursing Education*, *56*(9), 564-566. Google Scholar↗

[19] Haynes, K. N. (2008). Reasons for doctoral attrition. *Health*, *8*, 17-4. Google Scholar↗

[20] Mazerolle, S. M., Bowman, T. G., & Klossner, J. C. (2015). An analysis of doctoral students' perceptions of mentorship during their doctoral studies. *Athletic Training Education Journal*, *10*(3), 227-235. Google Scholar↗

[21] Holsinger Jr, J. W. (2008). Situational leadership applied to the dissertation process. *Anatomical Sciences Education*, *1*(5), 194-198. Google Scholar↗

[22] McNamara, J. F., Lara-Alecio, R., Hoyle, J., & Irby, B. J. (2010). Doctoral program issues: Commentary on companion dissertations. *A Doctoral Issues Presentation at the National Council of Professors of Educational Administration* Lexington, KY, August 2, 2006. Google Scholar↗

[23] Carter-Veale, W. Y., Tull, R. G., Rutledge, J. C., & Joseph, L. N. (2016). The dissertation house model: Doctoral student experiences coping and writing in a shared knowledge community. *CBE—Life Sciences Education*, *15*(3), ar34, 1-12. Google Scholar↗

[24] Devos, C., Boudrenghien, G., Van der Linden, N., Azzi, A., Frenay, M., Galand, B., & Klein, O. (2017). Doctoral students' experiences leading to completion or attrition: A matter of sense, progress and distress. *European journal of psychology of education*, *32*(1), 61-77. Google Scholar↗

[25] Beatty, S. E. (2001). The doctoral supervisor-student relationship: some American advice for success. *The Marketing Review*, *2*(2), 205-217. Google Scholar↗

[26] Carpenter, S., Makhadmeh, N., & Thornton, L. J. (2015). Mentorship on the doctoral level: An examination of communication faculty mentors' traits and functions. *Communication Education*, *64*(3), 366-384. Google Scholar↗

[27] Most, D. E. (2008). Patterns of doctoral student degree completion: A longitudinal analysis. *Journal of College Student Retention: Research, Theory & Practice*, *10*(2), 171-190. Google Scholar↗

[28] Stock, W. A., Siegfried, J. J., & Finegan, T. A. (2011). Completion rates and time-to-degree in economics PhD programs (with comments by David Colander, N. Gregory Mankiw, Melissa P. McInerney, James M. Poterba). *American Economic Review*, *101*(3), 176-88. Google Scholar↗

[29] Wamala, R., Ocaya, B., & Oonyu, J. C. (2012). Extended Candidature and Non-Completion of a Ph. D. at Makerere University, Uganda. *Contemporary Issues in Education Research*, *5*(3), 175-184. Google Scholar↗

[30] https://academy.pubs.asha.org/2011/12/higher-education-practices-that-promote-phd-completion/. Retrieved in September 2022.

[31] Preston, J. P., Ogenchuk, M. J., & Nsiah, J. K. (2014). Peer mentorship and transformational learning: PhD student experiences. *Canadian Journal of Higher Education*, *44*(1), 52-68. Google Scholar↗

[32] Devine, K., & Hunter, K. H. (2017). PhD student emotional exhaustion: the role of supportive supervision and self-presentation behaviours. *Innovations in Education and Teaching International*, *54*(4), 335-344. Google Scholar↗

[33] Van Rooij, E., Fokkens-Bruinsma, M., & Jansen, E. (2021). Factors that influence PhD candidates' success: the importance of PhD project characteristics. *Studies in Continuing Education*, *43*(1), 48-67. Google Scholar↗

[34] Chenevix-Trench, G. (2006). What makes a good PhD student?. *Nature*, *441*(7090), 252-252. Google Scholar↗

[35] Dericks, G., Thompson, E., Roberts, M., & Phua, F. (2019). Determinants of PhD student satisfaction: the roles of supervisor, department, and peer qualities. *Assessment & evaluation in higher education volume 44*(7), 1053-1068. Google Scholar↗

[36] Corsini, A., Pezzoni, M., & Visentin, F. (2022). What makes a productive Ph. D. student?. *Research Policy 51*(10), 104561. Google Scholar↗

[37] Lindvig, K. (2018). The implied PhD student of interdisciplinary research projects within monodisciplinary structures. *Higher Education Research & Development*, *37*(6), 1171-1185. Google Scholar↗

[38] Holbrook, A., Shaw, K., Scevak, J., Bourke, S., Cantwell, R., & Budd, J. (2014). PhD candidate expectations: Exploring mismatch with experience. *International Journal of Doctoral Studies*, *9*(1), 329-346. Google Scholar↗

[39] Björkman, B. (2015). PhD supervisor-PhD student interactions in an English-medium Higher Education (HE) setting: Expressing disagreement. *European Journal of Applied Linguistics*, *3*(2), 205-229. Google Scholar↗

[40] Dimitrova, R. (2016). Ingredients of good PhD supervision-evidence from a student survey at Stockholm university. *Utbildning och Lärande/Education and Learning*, *10*(1), 40-52. Google Scholar↗

[41] Sullivan-Bolyai, S., & L'Esperance, S. (2022). Reflections on virtual research conferences and PhD student socialization: The missing link of in-person human connectedness. *Applied Nursing Research*, *64* (April 2022), 151553. Google Scholar↗

[42] Alpert, F., & Eyssell, T. H. (1995). Getting the most from your doctoral program: Advice for the Ph. D. student in finance. *Journal of Financial Education*, 12-20. Google Scholar↗

[43] Groen, J. (2020). *Perceptions of Transformation and Quality in Higher Education: A Case Study of PhD Student Experiences* (Doctoral dissertation, University of Ottawa). Google Scholar↗

[44] Helfer, F., & Drew, S. (2013). A small-scale investigation into Engineering PhD student satisfaction with supervision in an Australian university campus. In *24th Annual Conference of the Australasian Association for Engineering Education* (pp. 1-9). Google Scholar↗

[45] Cunningham-Williams, R. M., Wideman, E., & Fields, L. (2019). Ph. D. Student Development: A Conceptual Model for Research-Intensive Social Work PhD Programs. *Journal of Evidence-Based Social Work*, *16*(3), 278-293. Google Scholar↗

[46] Ganesha, H. R., & Aithal, P. S. (2022). The '8Fs' Concept for Simplifying the Complications of Ph.D. Journey in India. *International Journal of Case Studies in Business, IT, and Education (IJCSBE)*, *6*(2), 334-345. Google Scholar↗

[47] Saunders, M., & Lewis, P. (2017). Doing research in business and management. Pearson. Google

Scholar↗

[48] Ganesha, H. R., & Aithal, P. S. (2022). *Doing Ph.D. in India. A Step-by-Step Guide.* First Edition. Notion Press. India & Singapore. Page 13. ISBN: 9798887832005. Google Scholar↗

[49] Cochran, W. G. (1977). Sampling Techniques: 3rd Edition. Wiley. Google Scholar↗

[50] Sotos, A. E. C., Vanhoof, S., Van den Noortgate, W., & Onghena, P. (2007). Students' misconceptions of statistical inference: A review of the empirical evidence from research on statistics education. *Educational research review*, *2*(2), 98-113. Google Scholar↗

[51] Kelly, M. A., & Kaczynski, D. J. (2006). Misconceptions students bring to qualitative research. *Qualitative Research Journal 6*(2), 31-44. Google Scholar↗

[52] Sarma, S. K. (2015). Qualitative research: Examining the misconceptions. *South Asian Journal of Management*, *22*(3), 176-191. Google Scholar↗

[53] Clements, D. H. (2007). Curriculum research: Toward a framework for research-based curricula. *Journal for research in mathematics education*, *38*(1), 35-70. Google Scholar↗

[54] Metcalfe, M., & Kiley, M. (2000). Arguing for PhD coursework. *Australasian Journal of Information Systems*, *7*(2), 52-59. Google Scholar↗

[55] Moreno, R. (2014). Management of the level of coursework in PhD education: A case of Sweden. *Journal of Applied Economics and Business Research*, *4*(3), 168-177. Google Scholar↗

[56] Ellis, A. K., & Fouts, J. T. (2001). Interdisciplinary curriculum: The research base. *Music Educators Journal*, *87*(5), 22-22. Google Scholar↗

[57] McEneaney, L. H., & Meyer, J. W. (2000). The content of the curriculum. *Handbook of the Sociology of Education*, 189-211. Google Scholar↗

[58] Card, K., Chambers, C. R., & Freeman Jr, S. (2016). Is there a core curriculum across higher education doctoral programs?. *International Journal of Doctoral Studies*, *11*(1), 127-146. Google Scholar↗

[59] Coombs, J. M. (2017). From Coursework to Dissertation: Lessons Learned on the Long Road to the PhD. *The Journal of Physician Assistant Education*, *28*(4), 226-228. Google Scholar↗

[60] Kiley, M. (2017). Reflections on change in doctoral education: An Australian case study. *Studies in Graduate and Postdoctoral Education*, *8*(2), 78-87. Google Scholar↗

[61] Sin, C., Soares, D., & Tavares, O. (2021). Coursework in industrial doctorates: a worthwhile contribution to students' training?. *Higher Education Research & Development*, *40*(6), 1298-1312. Google Scholar↗

[62] Fry, G., Tress, B., & Tress, G. (2006). PhD students and integrative research. In *From Landscape Research to Landscape Planning; Aspects of Integration, Education and Application* (No. 12, pp. 193-205). Springer. Google Scholar↗

[63] Alpert, F., & Kamins, M. A. (2004). Doctoral coursework is needed in Australasia. *Australasian Marketing Journal (AMJ)*, *12*(1), 66-72. Google Scholar↗

[64] Brokaw, J. J., & O'Loughlin, V. D. (2015). Implementation of an education-focused PhD program in anatomy and cell biology at Indiana University: Lessons learned and future challenges. *Anatomical Sciences Education*, *8*(3), 258-265. Google Scholar↗

[65] Stanfill, A. G., Aycock, D., Dionne-Odom, J. N., & Rosa, W. E. (2019). Strategies and resources for increasing the PhD pipeline and producing independent nurse scientists. *Journal of Nursing Scholarship*, *51*(6), 717-726. Google Scholar↗

[66] Sharmini, S., & Spronken-Smith, R. (2020). The PhD–is it out of alignment?. *Higher Education Research & Development*, *39*(4), 821-833. Google Scholar↗

[67] Gannon, F. (2006). What is a PhD?. *EMBO reports*, *7*(11), 1061-1061. Google Scholar↗

[68] Hockey, J. (1991). The social science PhD: A literature review. *Studies in Higher Education*, *16*(3), 319-332. Google Scholar↗

[69] Franklin, C., Lightfoot, E., Nachbaur, M., & Sucher, K. (2022). A Study of PhD Courses and Curricula Across Schools of Social Work. *Research on Social Work Practice*, *32*(1), 116-126. Google Scholar↗

[70] Kolmos, A., Kofoed, L. B., & Du, X. Y. (2008). PhD students' work conditions and study environment in university-and industry-based PhD programmes. *European Journal of Engineering Education*, *33*(5-6), 539-550. Google Scholar↗

[71] Piotrowski, C., & Zalewski, C. (1993). Training in psychodiagnostic testing in APA-approved PsyD and PhD clinical psychology programs. *Journal of Personality Assessment*, *61*(2), 394-405. Google Scholar↗

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