

# Assessment 4

*by* Roshan DAHAL

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# **Project title: The Impact of Artificial Intelligence on Student Learning, Cognitive Development and Creativity**

## **1. Research Methodology Proposal**

### **1.1 Descriptive summary**

<sup>21</sup> This study examines the impact of AI on learning, cognitive development and creativity of students. As AI tools grow widely in education, the research investigates whether they increase or obstruct independent thinking, problems and creativity. Its purpose is to understand how AI is changing traditional educational approaches and student development.

### <sup>22</sup> **1.2. Research questions**

- i. <sup>19</sup> To what extent does Artificial Intelligence influence academic performance and student learning outcomes?
- ii. To what extent does Artificial Intelligence affect creativity and cognitive development?

### <sup>19</sup> **1.3. Research objectives**

- i. To evaluate the impact of Artificial Intelligence on students' academic performance and learning effectiveness.
- ii. To analyse how Artificial Intelligence contributes to the development of creative abilities in students' and cognitive skills.

## **2. Alternative Methodology 1**

This section explores qualitative research approach as the guiding research approach as a possible methodology for my project title. It analyses proposed ways of sampling, data collection and analysis. I anticipate further use in the research, followed by the pros and cons of using the proposed methods.

### <sup>11</sup> **2.1. Research approach**

According to Creswell (2009), qualitative research is exploratory, and researchers use it to explore a topic when the variables and theory base are unknown. My research topic leaves many doors unlocked for exploring several aspects of AI in education. By nature, it aims to focus on the impact in relation to the students' experiences, which can only be better described by the students involved

themselves. This kind of exploration leads to a series of subjective data being gathered whose analysis is feasible and achievable only through the application of qualitative research methods.

## 2.2. Type of data

Both primary data will be used in this methodology. Primary data will be gathered by interviewing a sample of students who depend on AI tools to complete their tasks. Similarly, the empirical research and theoretical knowledge bases will pose as secondary data for this research. Each have their own pros and cons. For instance: Primary data are more trustworthy and have a high profile of appropriateness because they are gathered exactly for exact analysis whilst Secondary data are deemed more time and cost effective in comparison. Blending these both together can build an in-depth, enriched knowledge base to this research foreground.

Qualitative data are data representing information and concepts that are not represented by numbers (NNLM, 2022). In my research, I shall be using qualitative approaches which generate qualitative data that are highly subjective in nature. This type of data will assist me to gain an in-depth understanding of the findings that align with my research questions.

## 2.3. Sampling plan

This project will be using non-probability sampling. Non-probability sampling is defined as a sampling technique in which the researcher selects samples based on the subjective judgment of the researcher rather than random selection (Fleetwood, 2024).

I shall use convenience sampling to determine research participants for my study. According to Rahi (2017), convenience sampling describes the data collection process from a research population that is effortlessly reachable to the researcher.

The sample size of this project will be 20 participants acquiring higher education in Australia so that I will be able to get sample who experienced their academic journey without and with AI tools. This will ease the comparison process of creativity and their learning experiences firsthand.

## 2.4. Data collection plan

I plan on collecting data using in depth interview. In-depth interviews in research are open-ended talks with individual group members to discover new insights and grasp the group's social dynamics (Delve, Ho, & Limpaecher, 2024). I plan on conducting one-on-one sessions with the participants with semi-structures interview questions, recording the feasible ones with their

consent and interpreting their ways to find meaning applied to their behaviour. I shall also leverage several pieces of empirical research done in the past to collect adequate data in regard to my research topic as secondary sources of data for my research.

### **2.5. Data analysis plan**

For my research, I intend to transcribe and translate the raw data from the interview. I also aim to practice meaning making by comparing the data I gathered with existing literature by breaking information into themes by analysing participants recorded experiences. This will be fulfilled via narrative analysis. That is, I shall analyse the narratives of the participants themselves to understand how they make sense of their experience.

### **2.6. Advantages and Limitations of this alternative methodology**

Since the research will focus on gathering in-depth data about the experiences of everyone which highly increases the validity of the data collected. The use of open-ended questions will allow subjective data to flow which in turn makes exploration of the reasoning behind their answers easier. Similarly, accessing sample population will be easier as this research requires students pursuing higher education. Likewise, this method will allow me to observe my participants in their natural setting which increases the chances of real-world data collection.

However, the reliability of data obtained by using qualitative methods is on the lower side. This is because the replicability of similar research in the future might differ in results as the participants, unlike in quantitative study, shall answer subjectively which opens several meanings. Similarly, generalization of the data obtained to a larger population is also difficult due to smaller sample size. Furthermore, qualitative data analysis is a time-consuming process, requiring expertise as well. This also invites the probability of researcher bias whereby researcher's personal belief system influences data interpretation.

### **2.7. Ethical considerations in using the methodology**

<sup>16</sup> Researchers have a duty to 'protect the life, health, dignity, integrity, right to self-determination, privacy and confidentiality of personal information of research subjects' ("World medical association declaration of Helsinki", 2013). In my study, I shall maintain ethical considerations like confidentiality and anonymity by using pseudo names for the participants. Similarly, while selecting participants in my research I shall take verbally informed consent to participate in my

study, and to record our conversation. I shall not record conversation of a participant who denied the consent and shall rely on note-taking and repeated calls for gathering information.

### **3. Alternative Methodology 2**

#### **3.1. Research approach**

Quantitative research is a systematic approach to investigating phenomena through numerical data and statistical analysis. Through the collection and analysis of numerical data using structured tools, quantitative research helps us test hypotheses, identify patterns, and predict outcomes (Rose E., 2025). Quantitative research can turn abstract concepts into measures that can be objectively assessed (Bhandari, P; 2020, June 12). My research topic can open new avenues to understanding AI which will require lots of scientifically obtained and analysed data. The use of quantitative research approach will allow me to collect numerical data from a larger population of students in a short period of time. This might further enable me to use scientifically backed tools to analyse gathered data and identify patterns, correlations, or statistical differences in students' academic performance, problem-solving skills, and creative output before and after exposure to AI tools. Moreover, quantitative data can help determine whether students using AI show significant changes in learning efficiency, independent thinking, or creative confidence compared to those who do not.

#### **3.2. Type of data**

Both primary data will be used in this methodology. Primary data will be gathered by interviewing a sample of students who depend on AI tools to complete their tasks. Similarly, the empirical research and theoretical knowledge bases will pose as secondary data for this research. Each have their own pros and cons. For instance: Primary data are more trustworthy and have a high profile of appropriateness because they are gathered exactly for exact analysis whilst Secondary data are deemed more time and cost effective in comparison. Blending these both together can build an in-depth, enriched knowledge base to this research foreground.

Quantitative data are data represented numerically, including anything that can be counted, measured, or given a numerical value (NNLM, 2022). By applying quantitative research approach, I will be able to generate numeric data which will assist me in establishing a causal relationship between AI tools and creativity, learning experience; and further data driven decision making as well.

### 3.3. Sampling plan

This research will be carried out via a combination of convenience sampling and snowball sampling. Sampling is the procedure of choosing a subset of data from a defined population dataset for the purpose of chosen analysis. According to Rahi (2017), convenience sampling describes the data collection process from a research population that is effortlessly reachable to the researcher. Snowball sampling is a non-probability sampling method where new units are recruited by other units to form part of the sample (Nikolopoulou, 2023).

While convenience approach will allow for participation from various subjects, institutions and geographical areas, it will not ensure randomization. Therefore, the sample may not fully represent the students' population of the entire education system, and the conclusions may be influenced by self-selection bias. To address this limit, efforts will be made to encourage participation from students in various academic years and study programs. Consequently, findings will provide insight into learning experiences related to AI.

### 3.4. Data collection plan

I plan on collecting data using surveys. A survey is a method of gathering information using relevant questions from a sample of people with the aim of understanding populations (Qualtrics, 2025). I intend to conduct an online survey among higher level students who will be having exposure to AI tools in academic settings. That is, the respondents won't just be limited to Australia but from all over the world. The survey link can be shared via university mailing lists, student forums, and social media platforms, enabling access to a wide and diverse group of respondents. I shall also leverage several pieces of empirical research done in the past to collect adequate data in regard to my research topic as secondary sources of data for my research. The use of objective and close ended questionnaires will prevent the occurrence of researcher bias as well.

### 3.5. Data analysis plan

Since the aim of using quantitative approach is to try and establish correlation among variables, I intend to employ various data analysing tools and techniques like measures of central tendency in descriptive statistics. I shall also rely upon data analysing software like IBM SPSS Statistics.

Descriptive statistics are brief informational coefficients that summarize a given data set, which can be either a representation of the entire population or a sample of a population (Hayes, 2024). This involves using measures of central tendency i.e., mean, median and mode to analyse the



findings. Similarly, SPSS has a user interface that looks like Microsoft Excel as the UI is set up as a spreadsheet (Buggs, 2025). The letters in SPSS used to stand for Statistical Package for Social Sciences. This will help me cover a larger population in a short period of time and develop data filled with research. It will also further enhance the generalizability of the findings due to large sample size and diverse respondents.

### 3.6. Advantages and Limitations of this alternative methodology

Since the research will focus on gathering objective and factual data about the experiences of large number of respondents, it will escalate the replicability of the research. That is, people will be able to reconduct the experiment in similar manner. Similarly, this objective reduces researcher bias and subjectivity, enhancing the reliability and validity of findings. Online surveys will be time and cost efficient for my work.

However, there are chances the research will miss some complex yet significant aspects of the findings as this method, by nature simplifies complex details into numbers. Similarly, even though chances of researcher bias are limited, there might be the existence of selection bias whereby respondents themselves choose to take part in a survey. This might result in an unrepresentative sample. Moreover, this method might reduce the chances of being able to follow up any answers given after they have completed the survey due to the anonymity of the participants. This is especially true for validity of the findings if the results are inconclusive.

### 3.7. Ethical considerations in using the methodology

Researchers have a duty to 'protect the life, health, dignity, integrity, right to self-determination, privacy and confidentiality of personal information of research subjects' ("World medical association declaration of Helsinki", 2013). In my study, I shall maintain ethical considerations like confidentiality and anonymity by designing such type of survey. Similarly, I shall take digitally signed informed consent from the respondents to participate in my study.

#### 4. Recommendation

This proposal considers two <sup>18</sup> types of research design: qualitative research approach and quantitative research approach. While each of them has their own sets of upsides and downsides, I would choose a qualitative approach to gather data for my research.

A qualitative research approach is best suited for this study because it will allow me to interpret the effects of artificial intelligence on students' learning, creativity and cognitive development on a deeper level. Unlike quantitative methods, qualitative approaches will generate highly subjective data which will open up new avenues in this area of research. Employing qualitative methods to analyze abstract and subjective dimensions such as creative thinking, independent problem-solution, or intellectual engagement, which cannot be fully captured through numeric data alone. Even though the sample will be lesser in comparison, the data obtained will be rich and touch multi-dimension in this aspect.

The integration of AI in education is a rapidly developed and reference-dependent event. Using a qualitative design in this research will allow me to focus on capturing the meaning of students' perceptions, reflections and meanings associated with the use of AI-especially in relation to their independent thinking, problem-solving behaviour and creative abilities.

The rich, reference-dependent nuances of these cognitive and creative <sup>17</sup> processes may reduce quantitative measures that might play out in the research setting. In contrast, qualitative tools such as semi-structured interviews or open-ended questionnaires will enable participants to clarify personal experiences that are important to understand the widespread educational effects of AI tools. This approach will also allow for flexibility in data collection, enabling the findings of this research to highlight emerging subjects. Since it's not limited to pre-set answer choices, qualitative research often reveals new patterns or concerns that we might not think about asking in a survey.

As I have mentioned in alternative methodology 2, there are chances the research miss some complex yet significant aspects of the findings if explored in quantitative ways. So, using qualitative measures will allow us to study all the underlying and new emerging aspects in this research aspect as well. Similarly, even though survey will encompass larger population, the findings of qualitative method will be more reliable in comparison.

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