

Teaching Practice and Analytical Capacity among Degree College Students – A Study

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Abstract

This paper attempts to study how **teaching practice** is the culminating point and bedrock upon which the student teacher builds **analytical thinking capacity among Degree College Students**. College students need to have analytical thinking skills to complete research and develop new knowledge and innovation by themselves. Concept mapping is an efficient tool for analytical thinking skill development. Teaching practice is an integral component of teacher training. It grants student teachers experience in the actual teaching and learning environment. focuses upon developing the analytical thinking skills of College students by using concept mapping. Analytical skill is the ability to deconstruct information into smaller categories in order to draw conclusions. Analytical skill consists of categories that include logical reasoning, critical thinking, communication, research, data analysis and creativity. Analytical skill is taught in contemporary education with the intention of fostering the appropriate practises for future professions. The professions that adopt analytical skill include educational institutions, public institutions, community organisations and industry.

Richard J. Heuer Jr. explained that 'Thinking analytically is a skill like carpentry or driving a car. It can be taught, it can be learned, and it can improve with practice. But like many other skills, such as riding a bike, it is not learned by sitting in a classroom and being told how to do it. Analysts learn by doing.'. In the article by Freed, the need for programs within the educational system to help students develop these skills is demonstrated. According to scholars, workers 'will need more than elementary basic skills to maintain the standard of living of their parents. They will have to think for a living, analyse problems and solutions, and work cooperatively in teams'. Logical reasoning is a process consisting of inferences, where premises and hypotheses are formulated to arrive at a probable conclusion. It is a broad term covering three sub-classifications in deductive reasoning, inductive reasoning and abductive reasoning. While researching, it is important to distinguish what information is relevant to the data and avoiding excess, irrelevant data. Research involves the collection and analysis of information and data with the intention of founding new knowledge and/or deciphering a new understanding of existing data. Research ability is an analytical skill as it allows individuals to comprehend social implications. Research ability is valuable as it fosters transferable employment related skills. Research is primarily employed in academia and higher education, it is a profession pursued by many College s, individuals intending to supervise or teach research students or those in pursuit of a PhD.

Key words: Analytical Capacity, Degree College Students, Critical thinking, teaching profession

Introduction

Teaching practice is an important component of becoming a teacher. It grants student teachers experience in the actual teaching and learning environment (Ngidi & Sibaya, 2003:18; Marais & Meier, 2004:220; Perry, 2004:2). During teaching practice, a student teacher is given the opportunity to try the art of teaching before actually getting into the real world of the teaching profession (Kasanda, 1995). Student teachers also know the value of teaching practice and as remarked by Menter (1989:461), they perceive it as 'the crux of their preparation for the teaching profession' since it provides for the 'real interface' between studenthood and membership of the profession. As a result, teaching practice creates a mixture of anticipation, anxiety, excitement and apprehension in the student teachers as they commence their teaching practice (Manion, Keith, Morrison & Cohen, 2003; Perry, 2004:4). The development of learners' potential in the 21st century not only places great emphasis on fostering students to become academic, knowledgeable and independent, but also on that they become innovative, creative thinkers, effective doers and skillful problem solvers. In addition, their development of work and interpersonal skills are addressed. As a result, the current trends of teaching and learning pedagogies focus upon enhancing students' analytical thinking skill development, which directly leads to the development of critical thinking skills, problem solving skills and creative thinking skills (P 21, 2005). These skills are essential characteristics of College students. Analytical thinking skills have become one of the more important skills for students in the 21st century; particularly, in Higher Education levels, which aim for students to increase their High Order Thinking Skills (HOTS), so that they can develop themselves, build their own innovation and be effective leaders in society. Therefore, analyzing skills are regarded as essential skills for College students. Two kinds of logical reasoning are often distinguished in addition to formal deduction: induction and abduction. Given a precondition or premise, a conclusion or logical consequence and a rule or material conditional that implies the conclusion given the precondition, one can explain the following.

Deductive reasoning determines whether the truth of a conclusion can be determined for that rule, based solely on the truth of the premises. Example: "When it rains, things outside get wet. The grass is outside, therefore: when it rains, the grass gets wet." Mathematical logic and philosophical logic are commonly associated with this type of reasoning. The probability of the conclusion of a deductive argument cannot be calculated by figuring out the cumulative probability of the argument's premises. Dr. Timothy McGrew, a specialist in the applications of probability theory, and Dr. Ernest W. Adams, a Professor Emeritus at UC Berkeley, pointed out that the theorem on the accumulation of uncertainty designates only a lower limit on the probability of the conclusion. So the probability of the conjunction of the argument's premises sets only a minimum probability of the conclusion. The probability of the argument's conclusion cannot be any lower than the probability of the conjunction of the argument's premises. For example, if the probability of a deductive argument's four premises is ~ 0.43 , then it is assured that the probability of the argument's conclusion is no less than ~ 0.43 . It could be much higher, but it cannot drop under that lower limit. Aristotle, a Greek philosopher, started

documenting deductive reasoning in the 4th century BC. René Descartes, in his book Discourse on Method, refined the idea for the Scientific Revolution. Developing four rules to follow for proving an idea deductively, Decartes laid the foundation for the deductive portion of the scientific method. Decartes' background in geometry and mathematics influenced his ideas on the truth and reasoning, causing him to develop a system of general reasoning now used for most mathematical reasoning. Similar to postulates, Decartes believed that ideas could be self-evident and that reasoning alone must prove that observations are reliable. These ideas also lay the foundations for the ideas of rationalism.

There can be examples in which each single premise is more likely true than not and yet it would be unreasonable to accept the conjunction of the premises. Professor Henry Kyburg, who was known for his work in probability and logic, clarified that the issue here is one of closure – specifically, closure under conjunction. There are examples where it is reasonable to accept P and reasonable to accept Q without its being reasonable to accept the conjunction (P&Q). Lotteries serve as very intuitive examples of this, because in a basic non-discriminatory finite lottery with only a single winner to be drawn, it is sound to think that ticket 1 is a loser, sound to think that ticket 2 is a loser,...all the way up to the final number. However, clearly it is irrational to accept the conjunction of these statements; the conjunction would deny the very terms of the lottery because (taken with the background knowledge) it would entail that there is no winner.

Dr. McGrew further adds that the sole method to ensure that a conclusion deductively drawn from a group of premises is more probable than not is to use premises the conjunction of which is more probable than not. This point is slightly tricky, because it can lead to a possible misunderstanding. What is being searched for is a general principle that specifies factors under which, for any logical consequence C of the group of premises, C is more probable than not. Particular consequences will differ in their probability. However, the goal is to state a condition under which this attribute is ensured, regardless of which consequence one draws, and fulfilment of that condition is required to complete the task.

Objective:

This paper intends to explore and analyze **analytical thinking skills** and ability to collect and analyze information, problem-solve, and make decisions can be imbibed through **teaching practice among Degree College Students**

Teaching Practice for Degree college students: Analytical Thinking Capacity

Teachers' experience and teaching strategies are essential for the development of students' learning processes and analytical thinking skills. Lessons which aim to develop students' analytical thinking skills require teachers to select teaching and learning pedagogies applicable to particular learning content. Teachers are also required to plan lessons and to use appropriate teaching materials, or tools, in order to develop students' analytical thinking skills. The development of analytical thinking skills will take place when students practice and develop their analytical thinking skills through the learning process within the classroom. A number of research studies, found both inside and outside of Thailand, revealed that there were several teaching and learning pedagogies that could develop analytical thinking skills. That is, students' analytical thinking skills could be fully developed with the support of experienced teachers, well-designed lesson plans and effective tools used for analytical thinking skill development. Concept Mapping is an important tool, used for not only creating learning processes for students but also to evaluate students' overall understanding. Concept Mapping enables students to adopt 'Meaning Verbal Learning', which enhances their learning potential and further develops their analytical thinking skills. Students use concept mapping to sequence knowledge, and to build knowledge structures from most general to more specific content, which in turn leads to comprehensive understanding. In addition, concept mapping helps students to extend and create long-term memory (Novak, 1990; Novak & Wandersee, 1991).

Many research studies have pointed out that there has been extensive use of concept mapping, with a diversity of students in different teaching and learning contexts; in different educational perspectives; and with different educational and curriculum development (McClure, Sonak, and Suen, 1999; Weideman and Kritzing, 2003). Daley (2004) carried out research based upon constructivist teaching methods, by using concept mapping with College students. The participants were two groups of College students (21 students) who took an 'Adult Education Program'. One group was an experimental group, and the other was a control group. The duration of the study was one year (two semesters). The findings revealed that students used concept mapping as their learning strategies in two ways: (1) they used concept mapping to learn and to review new concepts; they mentioned that they enjoyed using concept mapping to sequence, analyze and understand information, and (2) they used concept mapping to acquire understanding of their own learning processes; concept mapping enabled them to understand how to relate The Asian Conference on Education 2012 Official Conference Proceedings Osaka, Japan 2 knowledge and interact with others, in order to develop their own meaning and understand how to create a body of knowledge. It can be said that concept mapping makes a substantial contribution to education. Inductive reasoning attempts to support a determination of the rule. It hypothesizes a rule after numerous examples are taken to be a conclusion that follows from a precondition in terms of such a rule. Example: "The grass got wet numerous times when it rained, therefore: the grass always gets wet when it rains." This type of reasoning is commonly associated with generalization from empirical evidence. While they may be persuasive, these arguments are not deductively valid: see the problem of induction.

Abductive reasoning, sometimes called inference to the best explanation, selects a cogent set of preconditions. Given a true conclusion and a rule, it attempts to select some possible premises that, if true also, can support the conclusion, though not uniquely. Example: "When it rains, the grass gets wet. The grass is wet. Therefore, it might have rained." This kind of reasoning can be used to develop a hypothesis, which in turn can be tested by additional reasoning or data. Diagnosticians, detectives, and scientists often use this type of reasoning.

Within the context of a mathematical model, these three kinds of reasoning can be described as follows. The construction/creation of the structure of the model is abduction. Assigning values (or probability distributions) to the parameters of the model is induction. Executing/running the model is deduction.

Other kinds of reasoning beside the three common categories above are:

- Defeasible reasoning
- Paraconsistent reasoning
- Probabilistic reasoning
- Statistical reasoning

Teaching practice for Deductive Reasoning

‘Deductive reasoning is a basic form of valid reasoning, commencing with a general statement or hypothesis, then examines the possibilities to reach a specific, logical conclusion’. This scientific method utilises deductions, to test hypotheses and theories, to predict if possible observations were correct. A logical deductive reasoning sequence can be executed by establishing: an assumption, followed by another assumption and finally, conducting an inference. For example, ‘All men are mortal. Harold is a man. Therefore, Harold is mortal.’ For deductive reasoning to be upheld, the hypothesis must be correct, therefore, reinforcing the notion that the conclusion is logical and true. It is possible for deductive reasoning conclusions to be inaccurate or incorrect entirely, but the reasoning and premise is logical. For example, ‘All bald men are grandfathers. Harold is bald. Therefore, Harold is a grandfather.’ is a valid and logical conclusion but it is not true as the original assumption is incorrect. Deductive reasoning is an analytical skill used in many professions such as management, as the management team delegates tasks for day-to-day business operations.

This principle can be demonstrated in a moderately clear way. Suppose, for instance, the following group of premises:

{P, Q, R}

Suppose that the conjunction $((P \& Q) \& R)$ fails to be more probable than not. Then there is at least one logical consequence of the group that fails to be more probable than not – namely, that very conjunction. So it is an essential factor for the argument to “preserve plausibility” (Dr. McGrew coins this phrase to mean “guarantee,

from information about the plausibility of the premises alone, that any conclusion drawn from those premises by deductive inference is itself more plausible than not”) that the conjunction of the premises be more probable than not.

Inductive Reasoning

Inductive reasoning compiles information and data to establish a general assumption that is suitable to the situation. Inductive reasoning commences with an assumption based on faithful data, leading to a generalised conclusion. For example, ‘All the swans I have seen are white. (Premise) Therefore all swans are white. (Conclusion)’. It is clear that the conclusion is incorrect, therefore, it is a weak argument. To strengthen the conclusion, it is made more probable, for example, ‘All the swans I have seen are white. (Premise) Therefore most swans are probably white (Conclusion)’. Inductive reasoning is an analytical skill common in many professions such as the corporate environment, where statistics and data are constantly analysed.

The 6 types of inductive reasoning

- **Generalised:** This manner utilises a premise on a sample set to extract a conclusion about a population.
- **Statistical:** This is a method that utilises statistics based on a large and viable random sample set that is quantifiable to strengthen conclusions and observations.
- **Bayesian:** This form adapts statistical reasoning to account for additional or new data.
- **Analogical:** This is a method that records on the foundations of shared properties between two groups, leading to a conclusion that they are also likely to share further properties.
- **Predictive:** This form of reasoning extrapolates a conclusion about the future based on a current or past sample.
- **Causal inference:** This method of reasoning is formed around a causal link between the premise and the conclusion.

Abductive reasoning commences with layered hypotheses, which may be insufficient with evidence, leading to a conclusion that is most likely explanatory for the problem. It is a form of reasoning where the conductor chooses a hypothesis that would best suit the given data. For example, when a patient is ill, the doctor gathers a hypothesis from the patient's symptoms, or other evidence, that they deem factual and appropriate. The doctor will then go through a list of possible illnesses and will attempt to assign the appropriate illness. Abductive reasoning is characterised by its lack of completeness, in evidence, explanation or both. This form of reasoning can be creative, intuitive and revolutionary due to its instinctive design.

Critical Thinking

Communication for Analytical Capacity

Communication is a process where individuals transfer information from one another. It is a complex system consisting of a listener interpreting the information, understanding it and then transferring it. Communication as an analytical skill includes communicating with confidence, clarity, and sticking with the point you are trying to communicate. It consists of verbal and non-verbal communication. Communication is an imperative component of analytical skill as it allows the individual to develop relationships, contribute to group decisions, organisational communication, and influence media and culture. Verbal communication is interaction through words in linguistic form. Verbal communication consists of oral communication, written communication and sign language. It is an effective form of communication as the individuals sending and receiving the information are physically present, allowing immediate responses. In this form of communication, the sender uses words, spoken or written, to express the message to the individuals receiving the information.

Conclusion

Schooling in higher education should be further developed, especially in the social sciences, and include the study of utilization from the package program, in order to develop the schooling process for critical thinking in higher education, and for the continued utilization of other functions of Cmap Tools software in higher education schooling. Teaching practice is a form of work-integrated learning that is described as a period of time when students are working in the relevant industry to receive specific in-service training in order to apply theory in practice. Creativity is important when it comes to solving different problems when presented. Creative thinking works best for problems that can have multiple solutions to solve the problem. It is also used when there seems to be no correct answer that applies to every situation, and is instead based from situation to situation. It includes being able to put the pieces of a problem together, as well as figure out pieces that may be missing. Then it includes brainstorming with all the pieces and deciding what pieces are important and what pieces can be discarded. The next step would be now analysing the pieces found to be of worth and importance and using those to come to a logical conclusion on how to best solve the problem. There can be multiple answers you come across to solve this problem. Many times creative thinking is referred to as right brain thinking. Creativity is an analytical skill as it allows individuals to utilise innovative methods to solve problems. Individuals that adopt this analytical skill are able to perceive problems from varying perspectives. This analytical skill is highly transferable among professions.

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