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Empowerment of Science Teaching Competence of M.Ed trainees through e-Content with a Metacognitive Instructional Design

N. Johnson
Instructor in Educational Technology
Perunthalaivar Kamarajar College of Education
Karaikal, U.T. Of Puducherry
johnchris81@gmail.com

INTRODUCTION

The Kothari commission report (1960) states, "If science is poorly taught and badly learnt, it is little more than burdening the mind with dead information and it could degenerate even into new superstitions". Revised national policy on Education (1992) envisaged launching of national mission for achieving universalisation of education and quality of education. It also emphasized the need for change in the teacher's outlook of teaching and dissemination of instruction. The advancement of science has to be effectively conveyed to the students without much time gap. Therefore science teaching competence becomes a crucial factor for the fast development of science and for the induction of interest among students to learn the basic and the latest advancement in science. The concept of Metacognition is used in the Instructional Design (ID) of the e-content as it will ensure the quality perspectives of e-content. For the instructional designer the issue is not leaving the learner a drift in a sea of content without the tools to be successful but practical ways to maximize metacognitive strategy transfer and thus equip learners with the appropriate navigational tools to reach shore. The primary objective of metacognitive skills to instructional designers is to provide them with a bundle of strategies that will make them more active information processors, students who monitor and control their learning activities, making local adaptations as required to ensure attaining key learning objectives. The special aim of applying e-learning materials to science is to enable student-teachers to make their thinking visible, to state arguments for difficult concepts in science. The e-content technology and Metacognition not only enable the student-teachers to review their thought processes but also to get them exposed of modern techniques and hence student-teachers may be helped regulate their thinking processes and enhance their science teaching competence.

DEFINITION OF THE PROBLEM

Though the importance of science is realized, the method of teaching of science is rather crude in most of the schools in India. The student-teachers generally do not get an opportunity to think independently and conceptualize the spirit of the subject while practice their teaching due to the lack of innovative methods in the classes. In fact the present state of teaching science in the majority of educational institutions at all levels needs a lot of overhauling. Hence, paramount importance must be given to the fact that the teachers of science should be trained and oriented with constructivist learning environment which consists of problem description and their multi-modal representation as the focus of learning, and the following interdependent components which assist student-teachers to understand and manipulate the difficult concepts in science: a collection of authentic information resources, related cases, cognitive tools to support knowledge construction and technology. E-Content learning encourages open-minded, reflective, critical and active learning. With e-content materials, the student-teacher, the future teacher will understand that he or she is changing from a provider of facts to the one that facilitates a learning environment.

It is in this assumption that the present study aims to find out the effectiveness of an innovative strategy with modern technological tools known as e-content with a metacognitive instructional design on science teaching competence of student-teachers doing their M.Ed. degree in the teacher education institutions. Based on the aim of the present study the following objectives are to be accomplished:

1. To develop and validate an e-content in science with a Metacognitive Instructional design.
2. To find out the effectiveness of the e-content on
- Science teaching competence
- Metacognitive Awareness
- Use of Metacognitive Instructional Design and
- Knowledge of ICT and Multimedia Components

3. To ascertain the effectiveness of orientation on Metacognitive instructional Design of the e-content on
- Science teaching competence
- Metacognitive Awareness
- Use of Metacognitive Instructional Design and
- Knowledge of ICT and Multimedia Components

4. To find out whether there is any significant influence of the following variables on science teaching competence of M.Ed trainees:
- Metacognitive Awareness
- Use of Metacognitive Instructional Design and
- Knowledge of ICT and Multimedia Components

SCOPE OF RESEARCH WORK

The present study believes that Metacognitive orientation helps student-teachers exhibit cognitive processes, to analyze, and manage their own thinking in pursuit of knowledge acquisition in order to gain insight and creativity to become critical thinkers. If student-teachers, the future teachers are trained with innovative approaches, then a number of school going children will be benefited in future. Therefore this study aims to develop and design an innovative strategy for enhancing the teaching competence of student-teachers.

Sample & Methodology

A sample of 60 M.Ed trainees was selected by Stratified random sampling method. This study targets on the student-teachers those who are pursuing M.Ed degree in Puducherry region. Experimental Research method was adopted for the study. Based on the above advantages of experimental research, the investigator adopted 'Experimental Method' with three parallel group with pre-test and post-test design for the present investigation.

Original Contribution

The present study has attempted to develop and validate the e-content on how to teach the concepts in science. This e-content is first of its kind which is programmed for student-teachers of science to learn an innovative teaching technique for teaching science concepts using metacognitive instructional design. Student-teachers can learn the e-learning modules at their own pace. The modules of e-content will throw light on the development of e-content, goals and objectives to be framed for a topic in science, pros and cons of a topic, metacognitive evaluation etc. with which a student-teachers of science will be at their best and gain insights to develop an e-content of their own.

CONSTRUCTION OF THE RESEARCH TOOLS

The investigator has constructed and validated four research tools for quantitative analysis and two tools for qualitative analysis. It is to state that number of studies reviewed has contributed for the development of these research tools. (Johnson,N & Ramganesh,E 2009; Johnson,N & Ramganesh,E 2011; Johnson,N & Ramganesh,E 2012; Ramganesh,E 2008).

- ***Science Teaching Competence Scale***

- ***Metacognitive Awareness Inventory for Science Teachers***
- ***Metacognitive Instructional Design Questionnaire for Teachers***
- ***Check list on Teachers' knowledge towards ICT and Multimedia components***
- ***Interview questionnaire on e-content for experts in Educational Technology***
- ***Interview questionnaire on e-content for experts in Physics***

DESCRIPTIVE ANALYSIS

In the present investigation the scores secured by the student-teachers of the control group, Experimental group I and Experimental group II were tabulated.

Table 1.T.1 Descriptive analysis for control, Experimental I and Experimental II groups

Group	N	Var	Pre-test		Post-test	
			Mean	SD	Mean	SD
CG	18	STC	11.22	2.31	15.13	3.53
		MAI	15.64	3.82	22.23	3.27
		MID	11.51	2.03	15.28	2.46
		ICT&MC	24.32	8.3	32.01	8.59
EXP I	18	STC	10.71	3.44	18.31	3.52
		MAI	21.35	3.28	24.24	2.63
		MID	14.41	1.78	15.73	2.19
		ICT&MC	26.93	10.72	33.02	8.67
EXP II	18	STC	12.32	2.34	22.08	2.56
		MAI	21.46	3.53	23.82	3.71
		MID	15.65	1.95	18.05	2.12
		ICT&MC	23.9	9.33	30.65	4.96

MAJOR FINDINGS OF THE STUDY

The following are the major findings that are obtained by testing the hypotheses quantitatively:

1. E-Content in Science is effective on enhancing Science teaching competence, Metacognitive awareness, Use of Metacognitive Instructional design and Knowledge of ICT and multimedia components.
2. Orientation on Metacognitive Instructional design of the e-content is effective on enhancing Science teaching competence, Metacognitive awareness, Use of Metacognitive Instructional design and knowledge of ICT and multimedia components.
3. Control group, Experimental group I and Experimental group II do not differ significantly in their Science teaching competence and Knowledge of ICT and multimedia components in the pre-test and they differ significantly in Metacognitive awareness and Use of Metacognitive Instructional design.
4. Control group, Experimental group I and Experimental group II differ significantly in their Science teaching competence ,Metacognitive awareness and Use of Metacognitive Instructional design in the post-test and they do not differ significantly in their Knowledge of ICT and multimedia components in the post-test.
5. The variables Metacognitive awareness, Use of Metacognitive Instructional design and Knowledge of ICT and multimedia components do significantly contribute to Science teaching competence of experimental group II in the post-test.

CONCLUSION

In the light of the research findings it is felt that the present piece of research may contribute on alleviation of difficulties of M.Ed. trainees in teaching of science with modern technology. It is hoped

that appropriate instructional design so called Metacognitive instructional design may be given for the needy trainees and the findings of the study may be taken into consideration for a better framework in developing science teaching competence among the M.Ed. trainees. Also the various Education commission reports insist on the development of teaching competence among the teachers at all levels. So, there is an urgent need to gear up national effort towards the implementation of this innovative strategy.

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