COURSE SYLLABUS
ILSE 616 Research in Science and Technology Education
Semester A (2022), 3(3-0-6) credit hours

Course coordinator

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Instructors

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Office

Panyapipat Buliding, Mahidol University, Thailand

Course Description

Research paradigms and methodology; quantitative research; qualitative research; mixed methods research; research question; research design; research instruments; data analysis; ethics in science and technology education research; analysis of science and technology education research; classroom action research

Class Period

Tuesday, 13.00-16.00 hr

Classroom

Face-to-face learning: Smart Classroom, Panyapipat Buliding, Mahidol University, Thailand

**On-line learning: via Cisco Webex meeting or ZOOM meeting (the lecturer will provide the link before the teaching date*)

Online: https://mahidol.webex.com/mahidol/j.php?MTID=ma3630d0eb6ea45a93abca615ce0a03e2
Meeting number: 2641 437 4588
Password: ILSE616
Host key: 419122

Course Learning Outcomes

The learning outcomes of this course are displayed as the table below:

Course Learning Outcome (CLO)	M.Sc.		Ph.D.	
	ELO	**Sub-ELO**	**ELO**	**Sub-ELO**
CLO1: Students should be able to develop an understanding of the nature and characteristic of quantitative research in science and technology education	ELO4	sub-ELO4.1	ELO4	sub-ELO4.1
CLO2: to develop an understanding of the nature and characteristic of qualitative	ELO4	sub-ELO4.1	ELO4	sub-ELO4.1

research in science and technology education				
CLO3: to practice skill in analyzing data	ELO4, ELO8	sub-ELO4.1, sub-ELO8.1	ELO4, ELO8	sub-ELO4.1, sub-ELO8.1
CLO4: to practice evaluating research papers	ELO4	sub-ELO4.1	ELO4	sub-ELO4.1
CLO5: to practice writing a research proposal	ELO4, ELO8	sub-ELO4.1, sub-ELO8.1	ELO4, ELO8	sub-ELO4.1, sub-ELO8.1

ELO stands for Expected Learning Outcome

Readings

The readings suggested for this course consist of some articles drawn from the science and technology education related database. The textbooks recommended for reading are: "Research methods in education: An introduction" written by William Wiersma, "Educational research: Planning, conducting, and evaluating quantitative and qualitative research" by John Creswell, and "Qualitative research: Theory, method, and practice" written by David Silverman.

Course Outline

Week	Topic	Teaching approaches*	CLO	Instructor 2022
1st (9 August 2022)	Research paradigms in quantitative and qualitative research and research ethics	Active lecture, Class discussion	CLO1, CLO2	KB
2nd (16 August 2022)	Types of qualitative research	Active lecture, Class discussion	CLO2	PS, SS
3rd (23 August 2022)	Qualitative research: research purposes and questions	Active lecture, Class discussion	CLO2	PS, SS
4th (30 August 2022)	Qualitative research: research methodology	Active lecture, Class discussion	CLO2	PS, SS
5th (6 September 2022)	Data collection and data analysis in qualitative research	Active lecture, Class discussion	CLO2, CLO3	KB, PS, SS
6th (13 September 2022)	Evaluation of research in science and technology education	Active lecture, Class discussion	CLO4	MP, TP
7th (20 September 2022)	Oral presentation: Analysis of qualitative research	Active lecture, Class discussion, Student presentation	CLO3	KB, MP, PS, SS, TP
8th (27 September 2022)	Types of quantitative research	Active lecture, Class discussion	CLO1	PC, PL, MP, WW
9th (4 October 2022)	Quantitative research:	Active lecture, Class discussion	CLO1	PC, PL, MP, WW

Week	Topic	Teaching approaches*	CLO	Instructor 2022
	research purposes and questions			
10th (11 October 2022)	Quantitative research: research methodology	Active lecture, Class discussion	CLO1	PL, MP, WW
11th (18 October 2022)	Instruments for data collection in quantitative research	Active lecture, Class discussion	CLO1	PL, PC, WW
12th (25 October 2022)	Data analysis in quantitative research	Active lecture, Class discussion	CLO3	PL, WW
13th (1 November 2022)	Oral presentation: Analysis of quantitative research	Active lecture, Class discussion, Student presentation	CLO3	PC, PL, MP, WW
14th (8 November 2022)	Mixed-methods approach	Active lecture, Class discussion	CLO1, CLO2	KB
15th (15 November 2022)	Classroom action research and Research proposal development	Active lecture, Class discussion	CLO1	PS, SS
16th (22 November 2022)	Oral presentation: Research proposal (1)	Active lecture, Class discussion, Student presentation	CLO5	All
16th (29 November 2022)	Oral presentation: Research proposal (2)	Active lecture, Class discussion, Student presentation	CLO5	All

Note ***On-line learning is available for overseas students and in any circumstances where face-to-face meetings are not possible e.g. COVID-19 pandemic***

Course Assignments

All assignments have to be submitted via e-mail to course coordinator and related lecturers within 6 pm of the identified date below. Any late assignment can be rejected to count.

Assignment 1: Learning reflective journal (CLO1)

Each student is required to keep learning journals, which reflects at least four main topics: "What I have learned", "What I want to know more", "Problems or questions", and "Comments or suggestions".

At the end of Qualitative research and Quantitative research, each student sends directly via e-mail to course coordinator and all lecturers who teach the related topics.

Criteria

This assignment will be evaluated with the four-level scale: Poor (1), Fair (2), Good (3) and Excellent (4).

The aspects of evaluation include:

1. Cleary identify key learning according to the targeted learning objectives

2. Cleary identify the gap of learning as things he/she what to know more

3. Cleary identify the problems or questions he/she faced during learning

4. Provide comments or suggestions that directly associate with the mentioned problems or questions

Assignment 2: Analysis of qualitative research (CLO1, CLO4)

Each student is required to select one quantitative research article to read, analyze, and evaluate them regarding their research purposes and questions, design, methodology, methods and instruments, data analysis, and results and discussion. Then, the student must perform an oral presentation regarding "Analysis of Qualitative Research" to the whole class. Presentation time: 15 minutes and Q&A 5 minutes.

Criteria

This assignment will be evaluated with the four-level scale: Poor (1), Fair (2), Good (3) and Excellent (4).

The aspects of evaluation include:

1. Evaluate all important sections of selected research
2. Identify all possible strengths of selected research
3. Identify all possible weaknesses of selected research
4. Provide clear and correct explanation about strengths and weaknesses of selected research
5. Motivate audience to participate in discussion/ presentation
6. Provide clear and correct answer for any questions
7. Provide presentation document to the audience

Assignment 3: Analysis of quantitative research (CLO2, CLO4)

Each student is required to select one qualitative research article to read, analyze, and evaluate them regarding their research purposes and questions, design, methodology, methods and instruments, data analysis, and results and discussion. Then, the student must perform an oral presentation regarding "Analysis of Quantitative Research" to the whole class. Presentation time: 15 minutes and Q&A 5 minutes.

Criteria

This assignment will be evaluated with the four-level scale: Poor (1), Fair (2), Good (3) and Excellent (4).

The aspects of evaluation include:

1. Evaluate all important sections of selected research
2. Identify all possible strengths of selected research
3. Identify all possible weaknesses of selected research
4. Provide clear and correct explanation about strengths and weaknesses of selected research
5. Motivate audience to participate in discussion/ presentation
6. Provide clear and correct answer for any questions
7. Provide presentation document to the audience

Assignment 4: Research proposal (CLO3, CLO4, CLO5)

At the final week of the course, each group of 2-3 students** is required to bring all of understanding learned from the course to construct research proposal in group. The basic components of the research proposal include title, introduction, research question(s), research purpose(s), expected outcome(s), methodology, and methods (e.g., participants, data collection, and data analysis). The length of the research proposal should not exceed 15 pages including references. Presentation time: 20 minutes and Q&A 10 minutes.

*****Note Number of students in each group will be flexible based on number of registered students.*

Criteria

This assignment will be evaluated with the four-level scale: Poor (1), Fair (2), Good (3) and Excellent (4).

The aspects of evaluation include:

1. Research Title

- Clear and concise

- Display the scope of research (e.g. What variables, with Whom, Where, When, Methodology used)

2. Research problem and its significance

- Clear and concise

- Identify the research problem and its origin

- Show strong evidences to support the problem

- Describe the significance of research problems

3. Theoretical or conceptual framework

- Identify the theoretical or conceptual framework of the research

- Show the process to synthesize the theoretical or conceptual framework

4. Research objective

- Align with research problem

- Cover all research problems

- Reflect research variables and research process

5. Research design

- Identify research design

- Research design is aligned with theoretical framework

- Research design is appropriated to answer research question

6. Data collection

- Identify Sample v.s. population/ Participants

- Data collection is aligned with research design

- Research instruments are appropriated with data collection

- Describe the process to construct instruments

- Describe the process to check the quality of instruments

7. Data analysis

- Data analysis is aligned with research design, type of data and research problem

- Use appropriated statistics

- Describe the process to analyze data

- Check validity of data

8. Value of the research

- Show originality or newness

- Level of impact to science and technology education field

- Show the way to utilize the research findings to the benefit of the field

9. Quality of writing

- Clear and concise

- Logical flow

- Consistency

- Provide references

Rubric for active participation

	Present (1)	**Attentive (2)**	**Engaging (3)**	**Satisfactory (4)**	**Exemplary (5)**
Active contribution	Show up but never contribute to class discussion	Seldom contribute to class discussion, unless asked	Occasionally contribute to class discussion	Regularly contribute to class discussion	Proactively and regularly contribute to class discussion
Active listening	Lack of attention to the discussed topic	Listen when others discuss and occasionally respond to the discussed topic	Listen when others discuss and sometimes respond to the discussed topic	Appropriately listen when others discuss and consistently respond to the discussed topic	Appropriately listen when others discuss and usefully respond to the discussed topic

Assessment***

Learning reflective journal	10%
Active participation	10%
Analysis of qualitative research	25%
Analysis of quantitative research	25%
Research proposal	30%

Final grades in the course will be determined by the total points earned as these:

90 - 100% = A,
80 - < 90% = B^{+},
70 - < 80% = B,
60 - < 70% = C^{+},
50 - < 60% = C.

<u>Note:</u> The students who enrolled as **"Audit" should attend the classes more than 80% of total hours and show the active participation more than 80%. The **"Audit"** students may be required to complete the task or works within the consideration from the course coordinator.*