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Appendices

Appendix (A): List of Semi Structured Interview

These questions have been used to interview the participants in the first study which has been described in chapter 4.

- What kind of data would you usually capture during the field trip? Audio, photos, text, etc.?
- What is the purpose of capturing and collect this data?
- How do you capture the data? What are the tools used?

Is there any electronic device that help you when collecting your experiences during the field trip?

- Where and when do you capture the data?
- What do you do with this data?
- How do you transfer this data?
- Are you interested in sharing your knowledge and experience with others?
- If the answer is yes: What do you like to share and how?
- If the answer is No: Why?
- How do you save this data?
- How do you organize this data?

Appendix (B): Category System: Case Study 1 /Botany

Thematic/ Content Subcategories and Main Categories

"Inductive Category Development"

What's the meaning of learning and field experience during the field trip? What kinds of tools are suitable to capture and share the learning experience in the field?

Main Theme (Kategorie)	Definition	Subcategories (Definition)	Important aspects
Form of Information	All text sections contains form of collected information that students has collected during they learning experience in the field	• **Qualitative data of Information** Students collected samples or written down text information, during they learning experience in the field • **Multimedia data of information** Students collected their learning experience using Multimedia formats, such as taking photos or recording videos of what they observed in the field	• **Qualitative data of information e.g** - Written Text - Samples - Drawing pictures or diagrams - • **Multimedia data of information e.g** - Taking photos - Recording videos

Objective	All the text sections contains the purpose of the students why collecting their learning experiences	• **<u>Learning</u>** Students purpose to collected their learning experience was to support the gain of their knowledge after the field work. Or for easy to learn and memorized, when seeing photos regard to the information. Or to record information that they can't find in websites. Or for the group working tasks. • **<u>Awareness</u>** Students purpose to collected their learning experience was to build up more awareness toward the sample (plant species) to see it in their natural environment instead of just samples, or a classroom information. Also easy to memorized when seeing photos regard to the information • **<u>Reflection</u>** To build up the students experience for they late experience	• **<u>Learning</u>** - Gain information - Writing reports - Group working • **<u>Awareness</u>** - Build up more awareness - Easy remembering • **<u>Reflection</u>** - Build up experience, and professional development
Tools	All the text sections contains tow regarding types of tools that students used to collect their learning experiences information	• **<u>Technology</u>** Use Mobile phone for capturing pictures, digital Camera as well. Also for writing text, text in regard of note taking. • **<u>Paper based-tools</u>** Using Notebook for writing text in regard of note taking, sometimes for drawing.	**<u>Technology</u>** e.g - Mobile phone - Digital Camera (e.g *DJI Osmo Pocket*) - Tablets • **<u>Paper-based tools</u>** - Note books

Documentation	All the text sections contain the activities have been identified in order to document the learning experience after the field trip	• **Transferring** The first activity is transferring the data: students transferred their multimedia data (phots) to digital storage media. And in Notebook which contain plant samples have been collected from the field with written information for each sample. • **Saving** Students print out their data after they had been saved in the form of field reports, or they save it into digital folders on their computers, or Dropbox • **Organising** The third activity is organising the data: In order to organising the learning experiences, the students prefer to organise their experience in a digital format to print them out for course works or field reports	- **Transferring e.g** - Emil - Reports - Bluetooth - **Saving** - PC folders - Dropbox **Organising e.g** Excel and Document
Data Sharing	All the text sections contains the activities have been identified in order to share the learning experience after the field trip	• **Notebook** Made one shared Notebook copies for each student, consist all the groups work field trips takes results in the end of the course • **Online** Put all the presentations data and photos in the Dropbox. Using Bluetooth during face to face meeting to share some information in the field	• **Notebooks** - Final Groups Work notebook • **Online** e.g - Dropbox - Bluetooth

Appendix (C): Case Study 2 /Marin Molecular Biology

Category System: Thematic/ Content Subcategories and Main Categories

"Inductive Category Development"

What's the meaning of learning and field experience during the field trip? What kinds of tools are suitable to capture and share the learning experience in the field?

Main Themes (Kategorie)	Definition	Subcategories (Definition)	Important aspects
Form of Information	All text sections contains form of collected information that students has collected during they learning experience in the field	• **Qualitative and quantitative data of information** Students collected samples or written down text information, during they learning experience in the field • **Multimedia data of information** Students collected their learning experience using Multimedia formats, such as taking photos or recording videos of what they observed in the field	• **Qualitative data of information e.g** - Written Text - Samples - Drawing pictures or diagrams • **Multimedia data of information e.g** - Taking photos - Recording videos

Objective	All the text sections contains the purpose of the students why collecting their learning experiences	• **<u>Learning</u>** Students purpose to collected their learning experience was to support the gain of their knowledge after the field work. Or for easy to learn and memorized, when seeing photos regard to the information. Or to record information that they can't find in websites. Or for the group working tasks. • **<u>Awareness</u>** Students purpose to collected their learning experience was to build up more awareness toward the sample (plant species) to see it in their natural environment instead of just samples, or a classroom information. Also easy to memorized when seeing photos regard to the information • **<u>Reflection</u>** To build up the students experience for they late experience	• **<u>Learning</u>** - Gain knowledge - Writing reports - Group working tasks • **<u>Awareness</u>** - Build up more awareness - Easy remembering • **<u>Reflection</u>** - Build up experience
Tools	All the text sections contains tow regarding types of tools that students used to collect their learning experiences information	• **<u>Technology</u>** Use Mobile phone for capturing pictures, digital Camera as well. Also for writing text, text in regard of note taking. • **<u>Paper based tools</u>** Using Notebook for writing text in regard of note taking, sometimes for drawing.	**<u>Technology</u>** e.g - Mobile phone - Digital Camera - Tablets • **<u>Paper based tools</u>** - Note books

Documentation	All the text sections contains the activities have been identified in order to document the learning experience after the field trip	• **Transferring** The first activity is transferring the data: students transferred their multimedia data to digital storage media • **Saving** Students print out their data after they had been saved in the form of field reports, or they save it into digital folders on their computers, or Dropbox • **Organising** The third activity is organizing the data: To organizing the learning experiences, the students prefer to organize their experience in a digital format to print them out for course works or field reports	- **Transferring e.g** - Bluetooth - Email - Microsoft office Document - Reports - **Saving** - PC folders - Notebooks - Dropbox • **Organising** - PC folders - Notebooks
Data Sharing	All the text sections contains the activities have been identified in order to share the learning experience after the field trip	• **Online** Put all the presentations and photos in the Dropbox. Using Bluetooth during face to face meeting to share some information in the field • **Face to face** Made a presentation after field trips for each group to share and discuses results.	• **Online** - Dropbox - Bluetooth - WhatsApp Group • **Face to face** - presentation

Appendix (D): List of Requirements Resources

Case Study 1 /Botany Biodiversity

This table shows the draft of developing the system requirements from different resources

- **Functional Requirements**

Requirement	Literature Review	Observation	Interview
The system must able to write text	X	X	13 students out of 14 mentioned this requirement
The system want able to draw sketch up drawings, figures and charts	X	X	1 out of 14
The system could able to split the screen to multiple screens		X	3 out of 14
The system must able to capture photos	X	X	14 out of 14
The system should able to record video	X		7 out of 14
The system want able to make a calculation	x		0 out of 14
The system should contain a campus	X		0 out of 14
The system must support the students learning and remembering	x	X	14 out of 14
The system must support the group work	X	X	14 out of 14
The system must contain a GPS	X	X	14 out of 14
The system should be able to link on the internet	X	X	12 out of 14
The system maut be linked with another apps such as Drop box		X	14 out 14
The system should have long life battery	x	x	6 out of 14

The system want be able to upload files on cloud computing	X		0 out of 14
The system should support group discussion		x	7 out of 14
The system must support file sharing		X	14 out of 14
The system must contains USB port	X	X	0 out of 14
The system must provide free hand writing style for drawing		X	11 out of 14
The system must split sections between public and privacy notes	X		4 out of 14
The system must contain internal clock	X	X	1 out of 14
The system must allow hand to be free		X	3 out of 14
The system must be easy write on by gloves		X	0 out of 14
The system must be Portable lightweight device	x		0 out of 14
The system must Built stabilized system in camera		x	1 out of 14
The system should contain Enough storage memory	x	x	2 out of 14
The system must have high resolutions Camera to capture colors		x	10 out of 14
The system must have magnifying glass		x	14 out of 14

- **Data Requirements**

Requirement	Literature Review	Observation	Interview
The system must be able to record qualitative data	x	x	14 out 14
The system want be able to record quantitative data	x	x	1 out of 14
The data layout must be clear and simple	x	X	14 out 14
the time and data should be register automatically	x	x	1 out of 14
The pages could be numbered automatically	x	x	4 out of 14
There should be various styles to tag and label data	x	x	2 out of 14

- **Environment Requirements**

Requirement	Literature Review	Observation	Interview
The system must work faster because the weather		x	1 out of 14
The user must be able to safely navigate through the environment while interacting with the system	x	x	14 out of 14
The system should be a waterproof to be protected	x	x	3 out of 14
The system must have highe resolution telescope		x	0 out of 14
The system should allow taking note at night	x		0 out of 14

- **User Requirements**

Requirement	Literature Review	Observation	Interview
The system must be used by Biology in field trip		x	14 out of 14
The system must not required Biology expert skills to be used		x	11 out of 14

Appendix (E): List of Requirements Resources

Case Study 2 /Marin Molecular Biology

This table shows the draft of developing the system requirements from different resources

- **Functional Requirements**

Requirement	Literature Review	Observation	Interview
The system must able to write text	X	X	14 students out of 14 mentioned this requirement
The system must able to draw sketch up drawings, figures and charts	X	X	14 out of 14
The system could able to split the screen to multiple screens		X	6 out of 14
The system must able to capture photos	X	X	13 out of 14
The system must able to record video	X		12 out of 14
The system should able to make a calculation			9 out of 14
The system want contain a campus	X		0 out of 10
The system must support the students learning and remembering	x	X	14 out of 14
The system must support the group work	X	X	14 out of 14
The system should contain a GPS	X	X	5 out of 10
The system should be able to link on the internet	X	X	4 out of 10
The system must be linked with another apps such as Drop box		X	14 out 14

The system could has long life battery	x	x	4 out of 14
The system want be able to upload files on cloud computing	X		0 out of 14
The system should support group discussion	x	x	14 out of 14
The system must support file sharing		X	10 out of 14
The system want contains USB port	X	X	1 out of 14
The system should provide free hand writing style for drawing		X	8 out of 14
The system should split sections between public and privacy notes	X		8 out of 14
The system must contain internal clock	X	X	13 out of 14
The system must allow hand to be free		X	12 out of 14
The system could be easy write on by gloves		X	5 out of 14
The system want be Portable lightweight device	x		0 out of 14
The system want Built stabilized system in camera		x	2 out of 14
The system should contain Enough storage memory	x	x	7 out of 14
The system could have high resolutions Camera to capture colours		x	2 out of 14
The system must have magnifying glass		x	11 out of 14

- **Data Requirements**

Requirement	Literature Review	Observation	Interview
The system must be able to record and qualitative data	x	x	14 out of 14
The system should be able to record quantitative data	x	x	8 out of 14
The data layout must be clear and simple	x	X	14 out of 14
the time and data should be register automatically	x		5 out of 14
The pages want be numbered automatically	x		0 out of 14
There must be various styles to tag and label data	x	x	10 out of 14

- **Environment Requirements**

Requirement	Literature Review	Observation	Interview
The system must work faster because the weather		x	10 out of 14
The user must be able to safely navigate through the environment while interacting with the system	x	x	14 out of 14
The system must be a waterproof to be protected		x	14 out of 14
The system must have highe resolution telescope		x	14 out of 14
The system want allow taking note at night	x		0 out of 14

- **User Requirements**

Requirement	Literature Review	Observation	Interview
The system must be used by Biologist in field trip		x	14 out of 14
The system should not required Biology expert skills to be used		x	7 out of 14