Author: Vossen, T.E.
Title: Research and design in STEM education : What do students and teachers think about the connection?
Issue Date: 2019-09-04

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Appendices

Appendix 1

We used explorative principal component analyses (PCA) on both the research and design sections of the ADRADA questionnaire, that each contained 24 items that were supposed to cluster in 7 categories: Relevance, Difficulty, Enjoyment, Anxiety, Self-efficacy, Context dependency and Future. Below are the eigenvalues of the components (Table A for the research section, Table B for the design section), the correlations between the components (Table C for the research section, Table D for the design section) and the component loadings after the Varimax rotation (Table E for the research section, Table F for the design section). For tables C and D we used a Promax rotation. The pattern matrices of the Promax rotation gave the same results as the Varimax rotation, hence we chose to display the Varimax rotation in tablees E and F as it is easier to interpret. Table G represents all item numbers and their corresponding categories of the research and design components of the ADRADA questionnaire. All analyses were performed in IBM SPSS Statistics version 22.

Table A. Eigenvalues of the components in the research section of the ADRADA questionnaire.

Total Variance Explained

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	6,149	25,623	25,623
2	2,650	11,043	36,666
3	1,742	7,257	43,923
4	1,402	5,842	49,765
5	1,320	5,499	55,264
6	1,169	4,872	60,137
7	0,963	4,013	64,149
8	0,799	3,327	67,476
9	0,735	3,062	70,539
10	0,694	2,892	73,431
11	0,653	2,722	76,152
12	0,603	2,512	78,664
13	0,598	2,492	81,156
14	0,549	2,287	83,443
15	0,534	2,225	85,668
16	0,468	1,951	87,620
17	0,464	1,934	89,553
18	0,431	1,797	91,351
19	0,410	1,708	93,058
20	0,393	1,636	94,694
21	0,371	1,545	96,240
22	0,330	1,376	97,616
23	0,303	1,264	98,880
24	0,269	1,120	100,000

Extraction Method: Principal Component Analysis.

Table B. Eigenvalues of the components in the design section of the ADRADA questionnaire.

Total Variance Explained

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	7,710	32,125	32,125
2	2,743	11,428	43,554
3	1,596	6,651	50,205
4	1,321	5,506	55,711
5	1,136	4,734	60,445
6	0,908	3,784	64,230
7	0,845	3,519	67,749
8	0,757	3,155	70,904
9	0,658	2,743	73,647
10	0,628	2,618	76,265
11	0,596	2,484	78,749
12	0,575	2,396	81,144
13	0,526	2,191	83,336
14	0,495	2,061	85,397
15	0,477	1,988	87,384
16	0,447	1,862	89,247
17	0,421	1,753	91,000
18	0,392	1,633	92,633
19	0,356	1,485	94,118
20	0,348	1,452	95,569
21	0,345	1,437	97,006
22	0,276	1,150	98,156
23	0,230	0,958	99,115
24	0,212	0,885	100,000

Extraction Method: Principal Component Analysis.

Table C. Correlations between the seven components in the research section of the ADRADA questionnaire.

Component Correlation Matrix							
Component	1	2	3	4	5	6	7
1	1,000	0,506	0,402	-0,079	0,442	0,345	-0,266
2	0,506	1,000	0,371	0,040	0,319	0,156	-0,064
3	0,402	0,371	1,000	0,097	0,311	0,254	-0,124
4	-0,079	0,040	0,097	1,000	-0,128	-0,126	0,254
5	0,442	0,319	0,311	-0,128	1,000	0,382	-0,303
6	0,345	0,156	0,254	-0,126	0,382	1,000	-0,231
7	-0,266	-0,064	-0,124	0,254	-0,303	-0,231	1,000

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.

Table D. Correlations between the seven components in the design section of the ADRADA questionnaire.

Component Correlation Matrix							
Component	1	2	3	4	5	6	7
1	1,000	0,591	0,476	-0,079	0,555	0,410	-0,383
2	0,591	1,000	0,434	0,062	0,341	0,197	-0,115
3	0,476	0,434	1,000	0,140	0,327	0,258	-0,108
4	-0,079	0,062	0,140	1,000	-0,067	-0,094	0,335
5	0,555	0,341	0,327	-0,067	1,000	0,423	-0,331
6	0,410	0,197	0,258	-0,094	0,423	1,000	-0,240
7	-0,383	-0,115	-0,108	0,335	-0,331	-0,240	1,000

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.

Table E. Component loadings after Varimax rotation in the research section of the ADRADA questionnaire.

Rotated Component Matrix[a]							
	Component						
	1	2	3	4	5	6	7
vII_1_24	0,810						
vII_1_14	0,736	0,331					
VII_1_18a	-0,719						
vII_1_9	0,667	0,418					
VII_1_6a	-0,536						0,358
vII_1_4		0,865					
vII_1_19		0,809					
vII_1_3	0,316	0,753					
vII_1_22			0,752				
vII_1_21			0,750				
vII_1_26	0,327		0,695				
vII_1_1			0,630				
vII_1_17				0,844			
vII_1_13				0,814			
vII_1_12				0,794			
vII_1_2					0,770		
vII_1_5					0,734		
vII_1_25					0,492		
vII_1_15					0,474	0,313	
vII_1_7						0,779	
vII_1_11						0,689	
vII_1_20						0,659	
vII_1_10							0,863
vII_1_23							0,853

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 6 iterations.

Table F. Component loadings after Varimax rotation in the design section of the ADRADA questionnaire.

Rotated Component Matrix[a]							
	Component						
	1	2	3	4	5	6	7
vII_2_6	0,758	0,341					
vII_2_1	0,745						
vII_2_12	0,696	0,384					
VII_2_14a	-0,681						
VII_2_17a	-0,614						
vII_2_5	0,590				0,336		
vII_2_2	0,302	0,825					
vII_2_22		0,820					
vII_2_9	0,337	0,780					
vII_2_7			0,765				
vII_2_24			0,744				
vII_2_19			0,735				
vII_2_4	0,361		0,626				
vII_2_10				0,817			
vII_2_20				0,805			
vII_2_8				0,801			
vII_2_21					0,772		
vII_2_23					0,742		
vII_2_13	0,444				0,465		
vII_2_3						0,808	
vII_2_11						0,778	
vII_2_15					0,321	0,565	
vII_2_25							0,855
vII_2_16							0,833

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 7 iterations.

A

Table G. All item numbers and their corresponding categories of the research and design components of the ADRADA questionnaire. Strike-through numbers were problematic items (which lowered the Cronbach's alpha and were not further included in the following Multilevel analyses).

Main category	Subcategory	Items in research component ADRADA (VII_1)	Items in design component ADRADA (VII_2)
Cognition	Relevance	~~1~~, 21, 22, 26	4, 7, 19, 24
	Difficulty	12, 13, 17	8, 10, 20
Affec	Enjoyment	9, 14, ~~16a~~, 24	1, 6, 12, ~~26a~~
	Anxiety	6a, 10, 18a, 23	14a, 16, 17a, 25
Control	Self-efficacy	2, 5, 15, 25	5, 13, 21, 23
	Context	7, ~~8~~, 11, 20	3, 11, 15, ~~18~~
Behaviour	Future	3, 4, 19	2, 9, 22

A

Appendix 2

Example items of the research component of the ASRADA questionnaire (translated from Dutch). Items in the design components were the same, except these statements were about 'design projects' rather than 'research projects'. The complete ASRADA questionnaire was constructed in Dutch and is available upon request.

Main category	Sub category	Example item.
Cognition	Relevance	I think that students in secondary school should learn to do research projects themselves as early as possible.
	Difficulty	I think that teachers find it difficult to supervise research projects.
Affection	Enjoyment	Supervising students doing research projects makes me enthusiastic.
	Anxiety	I feel nervous when supervising students doing research projects.
Control	Self-efficacy	If students have difficulties during research projects, I think I can manage to help them in a good way.
	Context	I have sufficient time to let students do research projects in my classroom.
Behaviour	Future	I would like to do a course to learn more about the research process myself.

A

Appendix 3

Table A. Intended learning outcomes of the four PLC meetings, organized per domain of Magnusson et al. (1999).

M1: knowledge of goals and objectives	**Moment in PLC** *supporting literature*
There is a difference between doing research (objective, analyzing knowledge) and designing (subjective, solving a problem).	1st meeting, lecture F *Vossen et al. (2018)*
In O&O projects, research and design complement each other, and can be combined by students and teachers.	1st meeting, lecture TE
Doing research (gaining knowledge) is part of, and necessary for, designing.	1st meeting, lecture TE *Sanders and Stappers (2008)* *Frankel and Racine (2010)*
Designing without any form of research is intuitive design, and almost becomes art.	1st meeting, lecture TE *De Jong and Van der Voordt (2002)*
When designing, one can also do research by testing and experimenting.	1st meeting, lecture TE
Looking up knowledge relies on existing facts, and doing research is creating/synthesizing new knowledge yourself.	1st meeting, lecture TE
Doing research or conducting a design request different skills.	1st meeting, lecture TE
One can do research through design, when the design itself helps to provide knew knowledge.	1st meeting, lecture TE *Frankel and Racine (2010)*
Design can enhance a research project when there is a 'need to do': for example, by designing an experimental setup.	1st meeting, oral explanation F
Basic knowledge about the research and design cycle(s).	1st meeting, lecture TE
The design cycle has multiple varieties, can be conducted more than once, is not linear, and has multiple dimensions.	1st meeting, lecture TE *Van Dooren et al. (2014)*
There are multiple research approaches: describing, explanatory, comparative, evaluative and design research.	1st meeting, lecture F
Knowing how to fine-tune a research question.	1st meeting, lecture F
After doing research, one can make a recommendation for the design of an application of the results.	1st meeting, oral explanation F
Reasons why it is important students learn about the connection between research and design.	2nd meeting, collective CoRe
M2: knowledge of students	
Knowledge of students' ideas about the connection between research and design.	2nd meeting, collective CoRe
Knowledge of difficulties students may have when learning/applying the connection between research and design.	2nd meeting, collective CoRe
Ideas about when (in which grade) students are mentally capable to learn about connection between research and design.	Discussion in 1st meeting
M3: knowledge of instructional strategies	

A

An O&O project can be adjusted to include both research and design components.	3rd meeting
The 'need to know' and 'need to do' can be made explicit in the O&O project or by the teacher.	3rd meeting *Kolodner et al. (2003a)*
Think of plug-in activities that can help enhance the connection between research and design in the O&O lesson.	2nd meeting, collective CoRe and design of plug-ins
Teachers test and apply these plug-ins.	Between 2nd and 3rd meeting
Teachers can evaluate applied plug-ins.	3rd meeting, evaluation
Teacher know they can make explicit the connection between research and design by denominating it to their students.	Oral explanation F *Puntambekar and Hubscher (2005)*
M4: knowledge of assessment	
Teachers can think about ways to measure whether students have understood that a connection exists between research and design.	2nd meeting, collective CoRe

Appendix 4

Technical design in biomedical technology
NLT module

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Appendix 5

Interview protocol of the semi-structured student focus groups.
3-4 students per group, each focus group lasted about 20 minutes.

Introduction

Thank you for participating in this study about the NLT module TDBT. During this interview, we will discuss your perceptions of the research and design projects that you conduct during the subject NLT. There are no right or wrong answers, just talk about the things that come to mind. These honest answers are the best and would help me tremendously. The answers that you give are confidential; your teacher will not hear about them. Do you have any questions before we start?

Introductory questions (10 minutes)

1. My study focuses on research and design projects in the classroom. What is doing research, according to you? What does it consist of?
   a. Have you ever done research yourself?
   b. What was that like? What does the research process look like according to you?
   c. In which subject was that? Was it during NLT?
   d. Can you give an example?
2. What is designing, according to you? Can you describe what designing looks like?
   a. Have you ever designed something yourself?
   b. What was that like? What does the design process look like according to you?
   c. In which subject was that? Was it during NLT?

d. Can you give an example?

3. I study the subject NLT. Do you like this subject? What are, according to you, the most important things you learn during NLT?
4. Within NLT, I specifically look at the module TDBT. What kinds of things do you learn during this module?
5. The module is about technical design. Where in this module do you see parts related to designing? Can you point them out?
6. Did you also do research during this module? If yes, in which parts of the module was that? Can you point them out?
7. Are there differences between research and design according to you? If yes, which differences are there?

Questions about the functions of research within design (10 minutes)

1. Do you think that research and design have something to do with each other within this module? If yes, how so?
   a. Did you apply this during the assignments? If yes, how? If no, why not?
   b. Did your teacher say something about this? If yes, what did he/she say? How does he/she make that clear to you? Did you do something with that knowledge, for example during the project or in your report?
2. Do you recognize in other NLT projects that research and design might have something to do with one another (or is this the first time you experience this connection)? If yes, how? If not, why?
3. Do you think that research and design have something to do with each other in "the real world"? If yes, in which ways do they connect?
   a. Does your teacher talk about this? How does he/she make that clear to you? Did you do something with that knowledge, for example during the project or in your report?
   b. Is it important for you to know something about this?
4. You just said … [function of research within design]. Do you use this idea during this NLT module, in your project or your end report? If yes, how do you do that? If not, how come you don't?
5. Does your teacher make clear to you whether research and design have something to do with each other? If yes, how? Did you do something with that knowledge, for example during the project or in your report?

Thank you for your time and participation.

Appendix 6

Interview protocol of the semi-structured teacher interviews.
Each interview lasted about 45-60 minutes.

Interview 1 (before module)

Introduction

Thank you for participating in this study about the NLT module TDBT. During this first interview, we will discuss your perceptions of research and design, and the connection you possibly recognize between these two activities. There are no right or wrong answers: this is an explorative interview. Before we begin I would like to ask you to read and sign this informed consent form to confirm that you agree that the interviews are recorded and that the data is handled confidentially.

Introductory questions (10 minutes)

1. During this interview, we will talk about the subject NLT that you teach. What are, according to you, the most important goals of this subject?
2. In this study, I only look at the module TDBT. What are, according to you, the most important goals of this module?
3. Where in this module do you see parts related to designing? Can you point them out?
4. Are there also research-related activities in this module? If yes, in which parts of the module?

Questions about the functions of research within design (10 minutes)

1. Looking at the specific module of TDBT, are research and design connected according to you? If yes, how are they connected?
2. Are research and design generally connected in the subject NLT?
3. Are research and design connected in professional, real-world practices (outside the school environment) according to you? If yes, in which ways can they be connected?
4. Are there differences between research and design according to you? If yes, which differences to you see?
5. What should students be able to know or do with this connection between research and design? Why is this important for students to know?
6. Do you adopt these ideas about the connection between research and design (and your ideas about the learning goals related to them) in the NLT lessons of this project? If yes, how? If no, why not?
7. How do you view your role as a teachers in making clear to students that research and design have something to do with each other?

8. Do you, as a teacher, make the connection between research and design explicit for your students? If yes, how?
   a. In a plenary fashion? During group work?
   b. Which instructional strategies do you use for this end? Can you give examples?
   c. What are advantages/disadvantages of this instructional strategy?
9. Do you have any experience with design yourself?
   a. What was that like? What does the design process look like according to you?
   b. Can you give an example?
10. Do you have experience with doing research yourself?
    a. What was that like? What does the research process look like according to you?
    b. Can you give an example?

Evaluation of example research and design modules

Lastly, I have two examples of STEM modules. Would it be possible, according to you, that in these modules research and design activities can enhance each other? If yes, could you explain how?

1. Example of a research module.
2. Example of a design module.

This was all I wanted to ask. Do you want to make any additions to the answers you gave? Is there something that I did not ask, but that you do think is important to mention?
Thank you for your time and participation.

Interview 2 (end of the module)

Introduction

Thank you for your participation in this study about the NLT module TDBT. During this last interview, we will look back on the module and the pedagogies you used. There are no right or wrong answers. I would like to hear your reflections on the teaching of this module: what went very good, and what went less well. Some questions may seem familiar to you, as they are adaptations of questions I already asked in the first interview.

1. Are research and design connected according to you? If yes, in which ways can they be connected?
   a. Do you recognize these ways of connection in the TDBT module?
2. Do you think it is important for students to know something about the connection between research and design? If yes, why is this important?
   a. Did this influence your lessons during the TDBT module? If yes, how?

3. What should students be able to know or do with this connection between research and design? Why is this important for students to know? (M1)
   a. Did you give specific attention to these learning goals during the module? If yes, what did you do? (M3)
   b. What do you think that the students have actually learned about the connection between research and design? (M2)
4. How did you make the connection between research and design explicit for your students during the module? (M3)
   a. In a plenary fashion? During group work?
   b. How did students react to this? Were they interested? (M2)
5. What difficulties did you and your students encounter during the module? (M2)
   a. What caused these difficulties? How did you react to them?
6. Did you encounter any difficulties related to the connection between research and design within the design projects? (M2)
   a. What difficulties did you encounter? What caused these difficulties? Can you describe the situation?
   b. Do you intend to deal with this differently should you teach the module again next year? If yes, how?
7. What went really well during the TDBT module?
   a. How come that these things went so well? Can you describe the situation?
   b. Did something go really well regarding the connection between research and design?
8. What instructional strategies did you use during the module? (M3)
9. Did you use any instructional strategies related to the connection between research and design? (M3)
   a. What did that look like in the classroom? What did you do?
   b. What are advantages/disadvantages of this instructional strategy?
10. How did you motivate students for a project in which they had to do both research and design activities? (M3)
11. How did you assess whether the students had reached the learning goals regarding the connection between research and design? (M4)
    a. Why did you choose for this form of assessment? (advantages, disadvantages)
    b. What exactly do you mean by … [portfolio, test, etc.]?
12. Which do's and don'ts would you recommend to a colleague who was also going to teach this module?
13. Are there things you would do differently next time?

This was all I wanted to ask. Do you want to make any additions to the answers you gave? Is there something that I did not ask, but that you do think is important to mention?
Thank you for your time and participation.

Appendix 7

Student focus groups are indicated with a letter A-D, to indicate in which of the student groups certain codes were mentioned. Teacher scores (from the two interviews) are indicated by an X. Teacher names are abbreviated: Joanne (J), Lisa (L), Samuel (S), Mary (Ma) and Mitchell (Mi). Grey marked codes are functions of research within design based on literature (deductive), white marked codes emerged during analyses (inductive).

Code	Explanation + literature	Student groups				Teachers				
		J	L	S	M+M	J	L	S	Ma	Mi
Functions of research within design										
FUN_RforD_notspecified	"You need research to do a design". The exact function of research in design is not specified.	AC	ABC	AC	BCD	X	X	X	X	X
FUN_RforD_lookingup	Looking up information about the topics involved in the design project (Christensen et al. 2016; Wild et al. 2010).	ABC	BC	ABCD	ABCD	X	X	X	X	X
FUN_RforD_whatexists	Research to learn from designs that are already there (for example by making a product history) (Crismond and Adams 2012; Cross and Cross 1998).	C	ABC	ABCD	BC	X	X	X		X
FUN_RforD_relevance	Research to discover whether the product you (want to) make actually solves a problem.	ABC	BC	C	AD	X				
FUN_RforD_improve	Research is used to improve existing ideas (Mehalik et al. 2008)	AC	AB	ACD	B	X			X	X
FUN_RforD_users	Target group/user research (Christiaans and Dorst 1992; Crismond and Adams 2012).	ABC	AB	C	CD	X				X
- FUN_RforD_users_experience	Research on users from your own experience.		C							
- FUN_RforD_users_simulation	Research on users by simulating their situation, for example by roleplay (Crismond and Adams 2012).			A		X	X	X		X
FUN_RforD_test	When designing, one can also do research by testing and experimenting. (Crismond and Adams 2012).	C	AC	A	BC	X	X	X	X	X

- FUN_test_troubleshoot	Experiments with prototypes: ‘analytic/diagnostic troubleshooting’ by testing hypotheses (Crismond and Adams 2012).			C		X				
- FUN_test_users	Checking prototype with target group (Crismond and Adams, 2012).				B				X	
- FUN_test_materials	Testing whether the materials used in the prototype are adequate (Mehalik et al. 2008).					X				
FUN_RforD_clearproblem	Orientation research for problem formulation (Christensen et al. 2016; Crismond and Adams 2012).	BC	AB		ABCD	X	X		X	X
FUN_RforD_PoR	Research to compose the Program of Requirements.		C	AD	BC	X	X		X	X
FUN_RforD_materials	Research on which materials are suitable for the design (Bursic and Atman 1997; Crismond and Adams 2012).	A	C	AC		X	X	X		X
FUN_RforD_solvedesignproblems	Analysis of problems that arise during designing.	A	B	B		X				X
FUN_RforD_collabresearchersanddesigners	Researchers can collaborate with designers to make a product.	C	AB		B			X		
FUN_RforD_ideatable	Investigating alternative options for each requirement, and systematically compare these options in a table of ideas.	B	A		A	X	X			
FUN_RforD_analysing	Critically analyzing the workings of the designed product on paper.		A							X
FUN_RforD_askexperts	Acquire information from contact with experts on the design topic.		A	C						
FUN_RforD_bestidea	Researching which idea is best.		A		B	X	X			X
FUN_RforD_costs	Analyzing the costs of (different parts of) the design (Bursic and Atman 1997; Christensen et al. 2016).	A	A			X				
FUN_RforD_howitworks	Analyzing critical questions in regard to how the design works (Crismond and Adams 2012).				CD			X		
FUN_RforD_howtomake	Research on how to manufacture the product/prototype (Crismond and Adams 2012; Kuffner and Ullman 1990).		AB					X		
FUN_RforD_location	Research on the location in which the designed product is to be used.		C	AC						
FUN_RforD_marketing	Research on which marketing strategies to use to promote the product.				D	X				
FUN_RforD_otherfields	Retrieving information from other fields related to the area in which the design problem is positioned.	C								
FUN_RforD_safety	Research on safety and legal issues (Bursic and Atman 1997; Crismond and Adams 2012).			A						

FUN_RforD_justify	Use research to justify the making of informed design decisions (Crismond and Adams 2012).					X	X	X	X	X
FUN_RforD_compare	Analyzing and systematically comparing different design ideas to one another.					X		X		
FUN_RforD_exteriordesign	Research on what the design should look like esthetically.					X				
FUN_RforD_methods	Examine which research or design methods to apply.								X	
FUN_DforR	Design can enhance a research project when there is a ‘need to do’: for example, by designing an experimental setup. (Kolodner et al. 2003; Vossen et al. 2019).		BC		C		X		X	
FUN_RaboutD	One can do research *about* design, to learn from good or failed practices (Crismond and Adams 2012; Frankel and Racine 2010).				C					
Key ideas										
KEY_iteration	Design *is* iteration (cf. Crismond and Adams 2012).	ABC	B		ACD	X	X	X		X
KEY_multiplecycle	The design cycle has multiple varieties, can be conducted more than once, is not linear, and has multiple dimensions (cf. Van Dooren et al. 2014).	A			A			X		
KEY_multipledesignspossible	There is not one single right solution for a design problem, multiple designs are possible.	B	A			X		X		
Value/relevance										
REL_improveproduct	Doing research within design is relevant because it helps students to improve existing products.	AC								
REL_dontstartoutoftheblue	Doing research within design is relevant because you cannot just start designing from nothing.		AC	B	CD	X		X		
REL_originalproduct	Doing research within design is relevant because research helps students to determine whether their product is original or innovative.		B	ABC	AB					

REL_qualityproduct	Doing research within design is relevant because it enhances the quality of the designed product/service (Crismond and Adams 2012).	C	AB	AD	B	X				X
REL_realworld	Doing research within design is relevant because it reflects real world practices (Sanders and Stappers 2008; Vossen et al. 2019).	ABC	AB	ABCD	BCD	X			X	
REL_study	Doing research within design is relevant because it will help students in their further studies (Vossen et al. 2019).		C	C			X		X	
REL_school	Doing research within design is relevant because it can help students in other school subjects or projects.								X	
REL_deeperlearning	Doing research within design is relevant because it can lead to deeper learning and mastery of theoretical concepts.						X			X
REL_stimulateinvestigativeattitude	Doing research within design is relevant because it can stimulate student to develop an investigative attitude.								X	
REL_negative	Doing research within design is perceived as irrelevant or boring by students.		B	AD	A			X		X
REL_external	Doing research within design is relevant because it is externally required, for example by the teacher, the module, or to get a good grade.		B	ABCD	BCD			X	X	
REL_logical	Doing research within design is perceived as relevant by students, because it is logical or better to so.	BC	ABC	ABCD	ABCD	X			X	