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Contribution Practice Illustration

Title Iteration type I of holistic DBR – transferability of design principles

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Abstract The iterative nature of design-based research (DBR) is a well-known and valued aspect of research in education. Nevertheless, iterations may take different formats, especially if a complex design object is at hand. Holistic DBR outlined by Reinmann (2020) provides an opportunity to display development of complex research objects. Still, there are not many examples to illustrate holistic DBR iterations. The current paper illustrates iteration type I of the holistic DBR and also displays how transferability of design principles can be tested. The iteration is a part of a wider DBR (Cycle 10) outlined in the article: *Design principles for developing online ethics resources – the outcome of holistic DBR process*. The current study utilised document analysis and a short questionnaire to evaluate whether the design principles would support creating ethics resources in various disciplines. The results of Cycle 10 contributed to elaboration of design principles, and elicited recommendations on facilitation of ethics training.

Keywords holistic DBR, design principles, ethics resource, iteration type

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Practice illustration

Iteration type I of holistic DBR – transferability of design principles

Anu Tammeleht

1.0 Introduction

The current paper is a practice illustration accompanying the article: *Design principles for developing online ethics resources – the outcome of holistic DBR process* (Tammeleht, 2022). The paper provides an illustration for Cycle 10 of the holistic DBR outlined in the abovementioned article (named ‘the main article’ from now on) as an illustration of iteration type I. The motivation, theoretical grounding and information about the holistic DBR are given in the main article and are not repeated here.

Based on the cycles preceding the current one, design principles were compiled. As the quality of DBR can be evaluated based on the transferability of the results (i.e. design principles), another cycle was required to verify their applicability (see Figure 4 and Table 2 in the main article presenting the entire holistic DBR process) (Tammeleht, 2022).

A research question was proposed: *Do the design principles support the creation of ethics resources in various domains?*

2.0 Methods used during Cycle 10

Various methods can be used as part of DBR, often mixing qualitative and quantitative data and analysis methods. For the current cycle, document analysis and a questionnaire were selected as it was possible to collect this data by implicating as little inconvenience on participants as possible. Document analysis is a process of evaluating documents of various formats (both physical and digital) (Bowen, 2009). According to Bowen (2009), document analysis is often used to triangulate findings but can also be used as a method of its own, especially to verify or support findings. The main functions of the documents in the current study were to provide evidence of the resource development process and to verify previous findings (i.e. design principles) (Bowen, 2009). Document analysis may include deductive or inductive qualitative approaches, either content or thematic analysis (Bowen, 2009). The current study will utilise deductive thematic analysis, where the codes are the design principles, and evidence of their manifestation was sought in the documents.

Cycle 10 process and participants

Based on the conducted cycles of the holistic DBR, initial design principles were outlined. They pertained to conceptualising, authoring and facilitating ethics training (see Figure 6 in the main article) (Tammeleht, 2022).

The piloting of the design principles was conducted in 2019-2020 by the author and one practicing teacher in Estonia by designing a Cyber Ethics online resource for upper secondary students. The teacher continues to use the resource as part of her *Cyber Security* course. No data was collected from the learners (other than general feedback), but the teacher feedback fed into improving the design principles.

For Cycle 10 volunteers were sought at a university in Estonia in January 2021. A proposal was made for an interdisciplinary course LIFE (<https://elu.tlu.ee/en>) where students can create their own content. 24 bachelor and master level students volunteered and worked in 4 groups for 5 months. All groups were given a table (see Table 1) with design principles and clarification of the principles.

Table 1: Design principles and specifications given to the LIFE course students

No.	Principle/Step	Specification
1	Do background search	Is there ethics training material available in that field? What is it like? Who is your target group?
2	Find an expert of the field and map the ethical issues of the field	Who is the expert? Why did you choose him/her? Ask the expert to outline the most important ethical issues of the field.
3	Build the framework with ethical topics of the field	How to visualise the topics? Are there various levels involved (e.g. different people)?
4	Decide on the epistemic object	How will the learners show how their knowledge is building? Justify your choice
5	Collect/write specific cases	Write/collect at least one case for each topic in the framework. What makes a good case? Where to get them?
6	Ethical analysis steps	Get to know the ethical analysis steps, apply them to your study material.

7	Compile support material	Which format will you use to present the support material? Is it the same for the entire resource or specific for the case? It may take the format 'What would the expert say?'
8	Create the web-based training	Which online platform would suit best? How to design an attractive website? Is it user-friendly? Make sure there is gradual exposure to material. Also think about feedback/reflection.
9	Pilot the material	Find a group of people from the field (part of your target group), try to include well-known people/experts. Conduct the training using the online material, collect user experience/feedback from the learners – which format would be best?
10	Improve material	Analyse feedback – what needs to be improved? Can it be done? How? How to make the existing website better/more user-friendly?
11	Dissemination	Make a dissemination plan. How to get the intended target group to use your material? What would their user journey be like? Where to advertise? How? Could it be offered to companies? Using celebrity endorsement?

This table scaffolded the entire design process and kept the goal orientation. Four groups created different online ethics resources for various domains. Based on document analysis of team-work, resource evaluation and a short questionnaire conducted among resource creators, design principles were elaborated and their transferability was evaluated.

Research ethics

The research followed the European Code of Conduct for Research Integrity (ALLEA, 2017), the Estonian National Code of Conduct (Hea Teadustava, 2017). No ethics review was required since the study did not involve an intervention in the physical integrity of research participants or deviate from the principle of informed consent. Participation was voluntary, and the participants were asked for their informed consent with all their rights clarified to them. The document analysis and resource evaluation was group-based, questionnaires were individual and anonymous. Even though the LIFE course was part of the students'

study programme, the analysis only took place after the course had ended, so the participation or non-participation had no effect on their passing the course.

Cycle 10 data collection

To evaluate the effectiveness and applicability of the design principles, data was collected from groups. Most data was qualitative in nature and came in the form of documentation of the group work process compiled by groups in their Google Drive folder (folders of 4 groups in total). The Google Drive folders contained (including visuals, slides and text documents):

Group 1 – 31 items

Group 2 – 24 items

Group 3 – 40 items

Group 4 – 29 items.

Three major documents were selected as these were consistent in all groups:

1. A table with design principles and the examples of their manifestation in the group's Google Drive folder (sometimes linked to the table, sometimes separately found in the folder);
2. Mid-term and final reports of the group work process;
3. Final version of the online ethics resource.

In addition, a short questionnaire was compiled to be answered anonymously by individuals asking about the usefulness of the design principles and collecting ideas for improvements.

Cycle 10 data analysis

Qualitative data (in the form of documents and the final ethics resource) was analysed utilising deductive thematic analysis. The codes were derived from the design principles (DP) 1-10. Design principle 11 (*reflection*) was not made compulsory for the teams due to time constraints set for the course. Instead, the groups had two extra principles – improving the resource and dissemination, which were set by the course requirements. The extra principles were not included in the current analysis as they did not pertain to the design principles of the main article.

The three sets of documents were thoroughly examined and manifestations of design principles were sought there. Two tables were compiled (see Tables 2 and 3) to see how the manifestation of design principles was displayed.

The questionnaire collected both quantitative and qualitative data. The first question inquired about the perceived usefulness of the design principles and the answers could be selected on the 1-5 Likert scale (1 – the principles were not useful, 5 – the principles were very useful). The second question was an open-ended and optional

question asking about improvement ideas. About 60 % of respondents provided a response.

Cycle 10 results and discussion

First, design principles were identified in various documents. To illustrate them, Table 2 was compiled. Each source lists the design principles that could be identified in them. It seems that the majority of design principles were manifested in all documents selected for analysis.

Table 2: Documents displaying the relevant design principles (DP)

Source	Group 1 – <i>Preventing bullying</i>	Group 2 – <i>Cyber ethics</i>	Group 3 – <i>Teacher ethics</i>	Group 4 – <i>Local political ethics</i>
DP table + examples	DP 1, 2, 3, 4, 5, 6, 7, 8, 9/10	DP 1, 2, 3, 5, 6, 7	DP 1, 5, 6, 7, 9/10	DP 1, 2, 3, 5, 9/10
Mid-term (MT) and final (F) reports	MT – DP 1, 2, 3, 4; F – 1, 2, 3, 5, 7, 8, 9/10	MT – DP 1, 2, 5, 6, 7; F – 1, 5, 6, 7, 8	MT – DP 1, 2, 3, 5, 6; F – 1, 2, 3, 5, 6, 7, 8, 9/10	MT – DP 1, 5; F – 1, 2, 3, 4, 5, 7, 8
Final online version	DP 2, 3, 4, 5, 6, 7, 8, 9/10	DP 1, 3, 4, 5, 6, 7, 8 (9/10 in instructions)	DP 1, 3, 4, 5, 6, 7, 8 (9/10 in instructions)	DP 1, 2, 3, 4, 5, 7 (limited), 8

To get an overview of the manifestation and effectiveness of the design principles, an overview table was compiled. Table 3 includes manifestations of design principles across all documents included in the analysis. The first column displays the topic sought (based on the design principles created). Columns 2-5 have manifestations of those design principles in all the groups.

Table 3: Manifestation of design principles across all documents

Theme (principle)	Group 1 – <i>Preventing bullying</i>	Group 2 – <i>Cyber ethics</i>	Group 3 – <i>Teacher ethics</i>	Group 4 – <i>Local political ethics</i>
DP1 – background	5 articles/research papers; 6 resources	10 articles/research papers; 4 resources	6 articles/research papers; 7 resources	10 resources, mostly books (8)
DP2 – expert	1 expert, thorough background search + meeting minutes	2 experts, background given, advice collected	‘Experts’ – no number given, some background information	1 expert and 1 potential facilitator, but included at the end
DP3 – framework	3 categories/topics identified	6 categories/topics identified	3 categories/topics identified	3 categories/topics identified
DP4 – epistemic object	Changed: Jamboard, Word document, Google Form, Flippity	Google Docs	Google Docs, Google Forms	Google Forms, an interactive game

DP5 – cases	1 article about topical cases; cases created along with the framework, advice from the expert	Cases collected along with the framework, sources added	Cases and framework created together, advice from experts	Looks like the cases and framework were created together. Group's own experiences.
DP6 – ethical analysis	Initially only random questions provided. After scaffolding ethical analysis steps with adapted wording.	A good visual created for the steps. More elaborate questions for adults.	Ethical analysis steps were provided in the form of a questionnaire after the case.	Not present. Random (no apparent structure) questions and tasks.
DP7 – support material	Takes the form of 'expert advice'; also additional resources are provided.	Examples of possible solutions created by the team, checked by the expert. No solutions for all cases.	Possible solutions provided, additional resources linked.	Some support material is provided, presented before the cases, rather superficial.
DP8 – website	Wix platform used, 3 different versions, updated based on the user experience feedback.	Wix – very professional layout. Updated based on expert advice.	Wix platform used, not very user-friendly, some feedback collected.	Google Sites, not user feedback collected, quite erratic.
DP9/10 – groups + facilitation (piloting)	Piloting organised with youth workers (potential facilitators), minutes and feedback of piloting	Not piloted due to time constraints. Instructions propose using the training material alone or in a team.	Piloted with 10 practicing teachers working in groups, feedback collected.	Not piloted, no instructions provided for potential facilitators. 1 potential facilitator consulted for feedback.

All in all, as displayed in Table 3, most design principles were targeted at some point in the design process. Background search was quite thorough by all groups, various sources were consulted and this helped the groups' orientation in the selected field. In addition to background, all groups had at least one expert. Even though some groups did not provide much proof of the role of the expert, the teams that collaborated closely with the expert provided excellent support material (e.g. *Preventing bullying*, *Cyber ethics* and *Teacher ethics*).

It was also visible how one design principle contributed to the outcomes of others. This was especially prominent in the creation of the framework and cases. Groups would often start collecting cases and based on their topics, then identified the more general topics and created the framework. The epistemic object proved to be a challenge for the groups.

The epistemic object is necessary to provide structural scaffolding to the learners, display their knowledge building as well as keep the focus (Scardamalia & Bereiter, 2006, Hakkarainen, 2009). Groups struggled with choosing the best option; the originally chosen epistemic object was occasionally replaced due to technical problems when they tried to include the chosen object in the online environment. Free platforms occasionally limit the options to be included.

The selected target group was also considered while compiling the ethical analysis steps. For example, the *Preventing bullying* resource was targeted at students aged 10-15 and the ethical analysis steps were adapted to their level. *Cyber ethics* training was targeted at adolescents and adults and various ethical approaches were included (which would be challenging for younger learners).

Support material was provided by all groups, but occasionally it preceded the tasks (e.g. for the *Local political ethics* resource). The groups that provided support material in the form of 'expert opinion' were able to compile the most logical learning trajectory. In knowledge building the additional information (often provided by the textbook or teacher) is evaluated by the group, often also compared to their own responses and new knowledge is constructed (Scardamalia & Bereiter 2006). To do that, it would be more logical for learners to construct their own answers and only then make the comparison with the expert opinion. At the same time, it is important to provide possible solutions to ethical analysis steps to avoid misconceptions. Almost all teams provided extra resources for further reading (included as links to the online resource).

The usability of the online platform seemed to depend on the skills of the team members – with more skilled members, a more professional layout was created, while with more limited skills, user-friendliness suffered. It is advisable to find a more skilful web designer to enhance user experience. Piloting was conducted by 2 groups and it proved to be beneficial. Feedback from users was very positive and improvements were made to the online resource based on the user feedback.

Questionnaire results showed that about 70 % of the participants thought the design principles were useful or very useful. About 20 % of respondents were neutral and 7 % considered them not so useful. 60 % of respondents also provided their feedback – most responses said that the design principles were logical and supportive. One respondent claimed that it was difficult to cover all the principles in 5 months and one comment was about the epistemic object – noting, that it may change throughout the process.

3.0 Conclusion

Based on the results it can be concluded that the design principles indeed provide sufficient guidance to create new ethics resources and thus also answer the research question of the study. Based on the lessons learned the design principles were elaborated.

Principle 3, *building a framework* in the conceptualisation phase was elaborated. The study revealed that building the framework and collection of cases may take place hand in hand. Occasionally, collecting various cases in one document may show the common topics and contribute to finalising the framework.

Principle 6 (*guiding questions*) was also in the focus during the study. The target groups should be considered as the ethical analysis steps and/or additional questions may need to be modified according to the age of the potential users. Also, questions should have some consistency to provide structural scaffolding.

Support material in Principle 7 and its content was also present in Cycle 10. The study showed that the support material – perhaps in the format of ‘expert opinion’ or ‘possible solutions’ – should follow the case discussion and ethical analysis, as the users see the need for ‘advice’ only after having provided solutions of their own. Comparing their own answers and the expert's opinion is an important learning opportunity.

Principle 8 (*website design*) was also elaborated after Cycle 10, where data indicated that well-considered layout and collecting user experience feedback may help improve the online environment. All groups who piloted the resource collected valuable feedback and were able to improve their resource.

The choice of the epistemic object may have an impact on the group work outcome. Indeed, the technical solutions may be limited, but it is advisable to choose a simple option for the training, e.g. a Google Drive document, a form to fill or Jamboard. All of these can be shared online; documents can also be printed out for face-to-face collaboration. It is acceptable to change the epistemic object throughout the design process, especially if the user experience feedback suggests it.

All in all, the design principles outlined in the main article do support creating ethics resources in various domains according to the outcomes of the current study. The design principles guide developers to create evidence-based ethics resources and help learners gradually

advance their ethics competencies in their field. Future studies should focus on monitoring the advancement of ethics competencies with the help of the new ethics resources.

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