

Design considerations for creating eLearning animations



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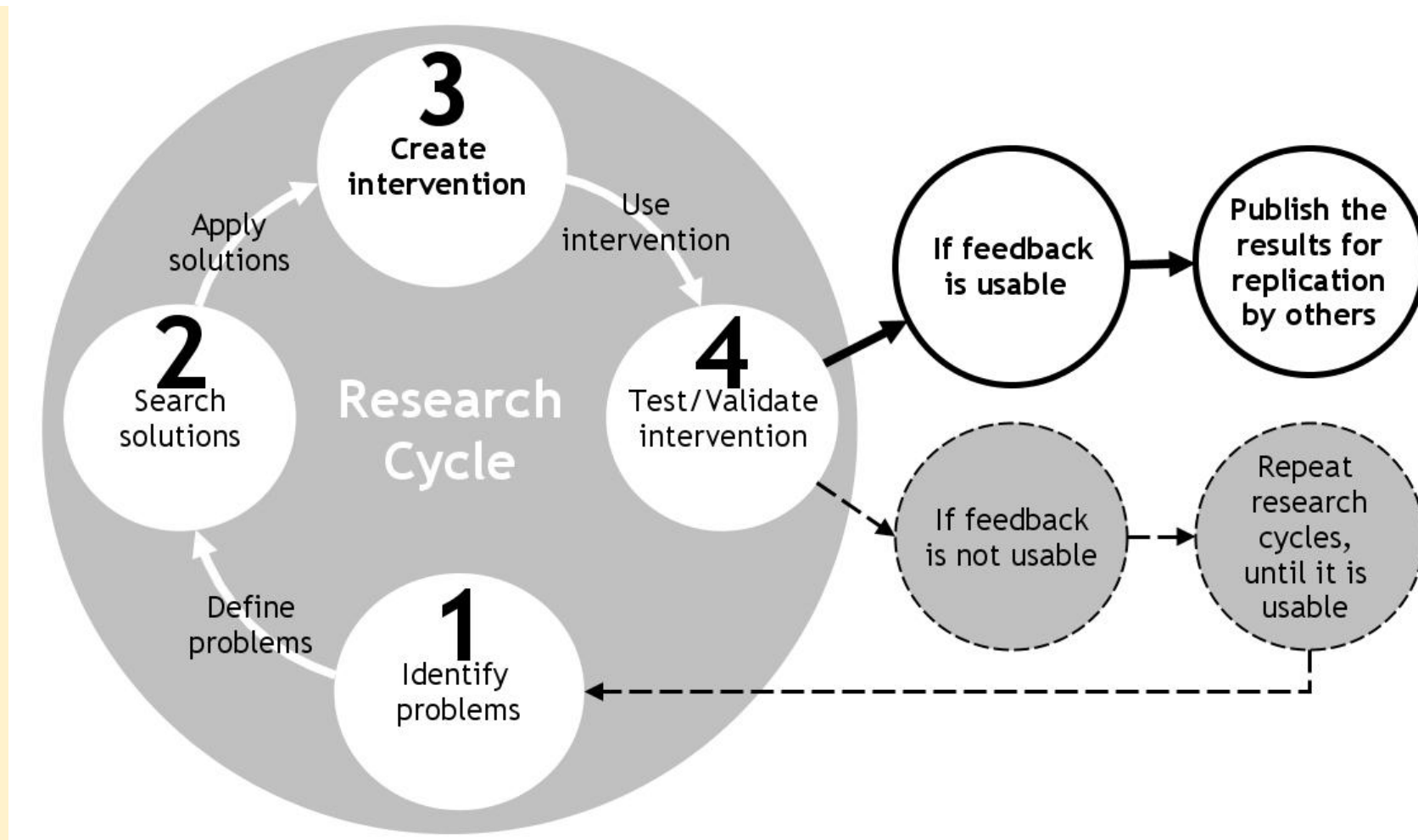
Learning object (LO) is a smallest independent structural experience that contains an objective, a learning activity and an assessment. Usability of LOs is important for creating effective eLearning content. Major stakeholders participating in a typical LO creation process are the subject matter experts (SMEs), instructional design (ID) writers and animators. Literature suggests that constant communication between these stakeholders, assisted with good documentation results in usable LOs. However, this ideal scenario is difficult to implement, owing to scarcity of experienced personnel, and limited availability of these experts. Templates are used at respective stages to achieve systematic communication in the LO creation process. One of the key problem that still persists is the miscommunication between ID writers and animators. Face-to-face interaction between ID writers and animators is a popular solution applied to address this problem. However, having unlimited face-to-face interaction as and when required, is not a scalable option.

The focus of this research is on this communication between ID writers and the animators, since this is the stage where the textual + verbal information is translated in to visuals. We analyze feedback from the animators, which reveals lack of visual communication (VC) aspects in the ID documents received. Further, we modify ID template (IDT) by operationalizing principles from VC domains (graphic design, multimedia, interaction design and animation). Design based research (DBR) is used for conducting research cycles (RCs) to modify the IDT. In the initial RCs, ID writers (n=16) and animators (n=15) validate the versions of IDTs until a version is found usable. Multiple experiments are conducted with students (n=128) and SMEs who compare usability of two types of LOs. First type is created using IDT having VC principles and the other type is created without the VC principles. Results show that the LOs created using VC principles are more usable, as compared to the LOs created without them ($p=0.000$ and $z=0.016$). Unstructured interviews with SMEs reveal that the LOs created with the VC principles, are not only usable, but these LOs are engaging and promote learning.

Research Problem

What **modifications** to the existing ID templates can **reduce** the dependency on the **face-to-face interaction** with VC expert?

How to **incorporate** the VC principles (provided by VC expert) into the existing ID templates?

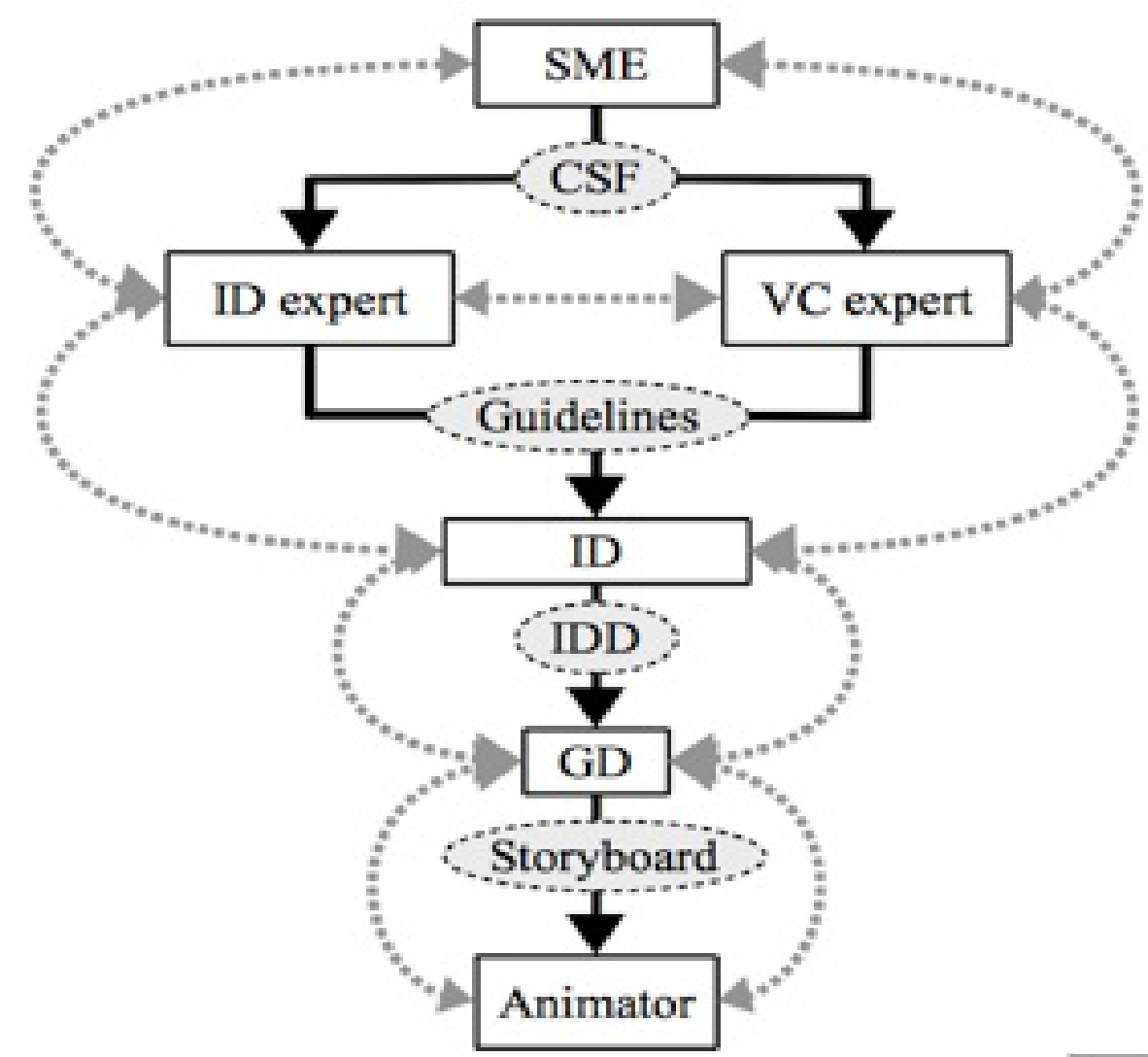


Typical research cycle in a Design Based Research

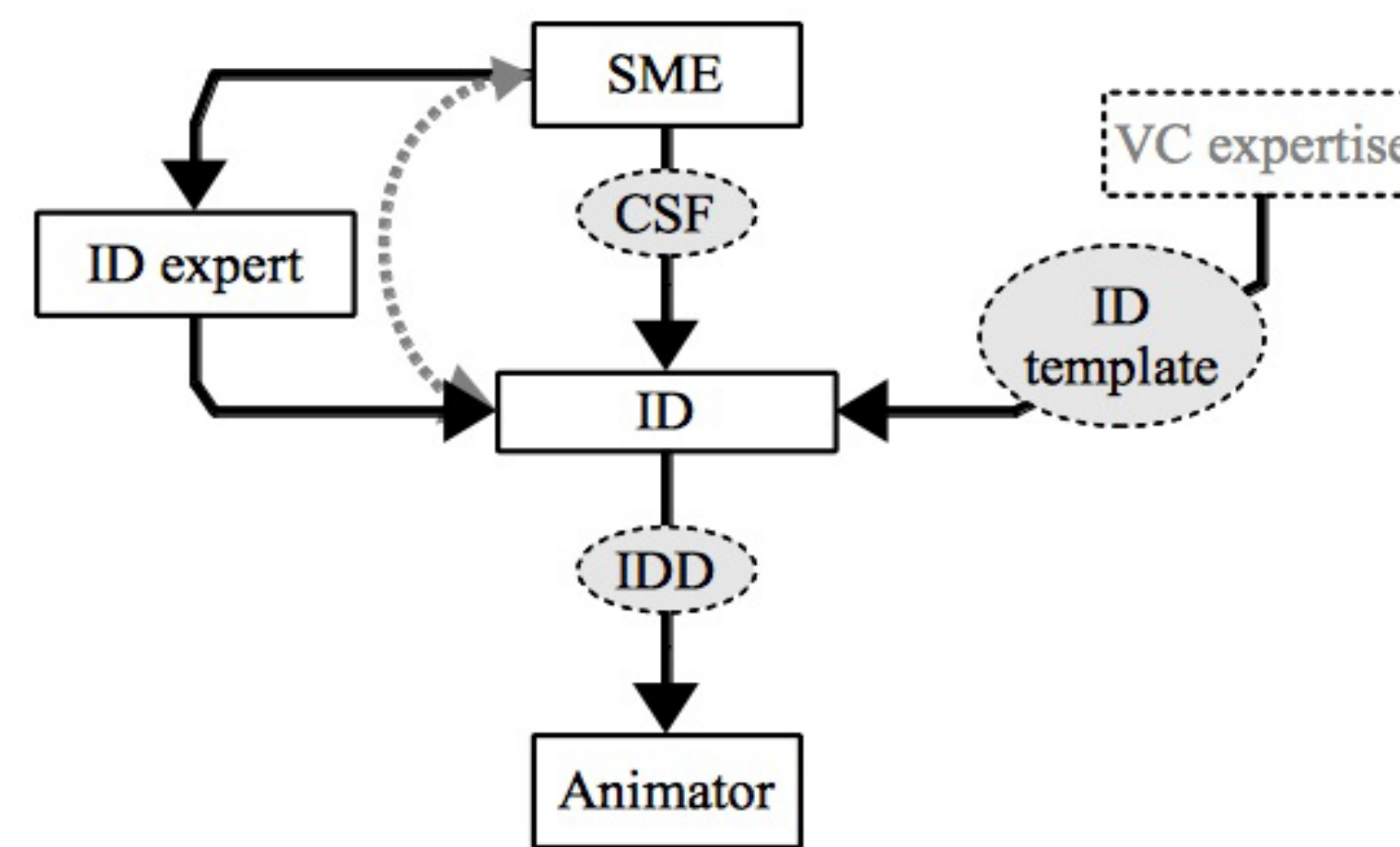
Research Questions

Would students find the LOs created using a template having VC principles embedded, to be more usable than the LOs created using a template without VC principles?

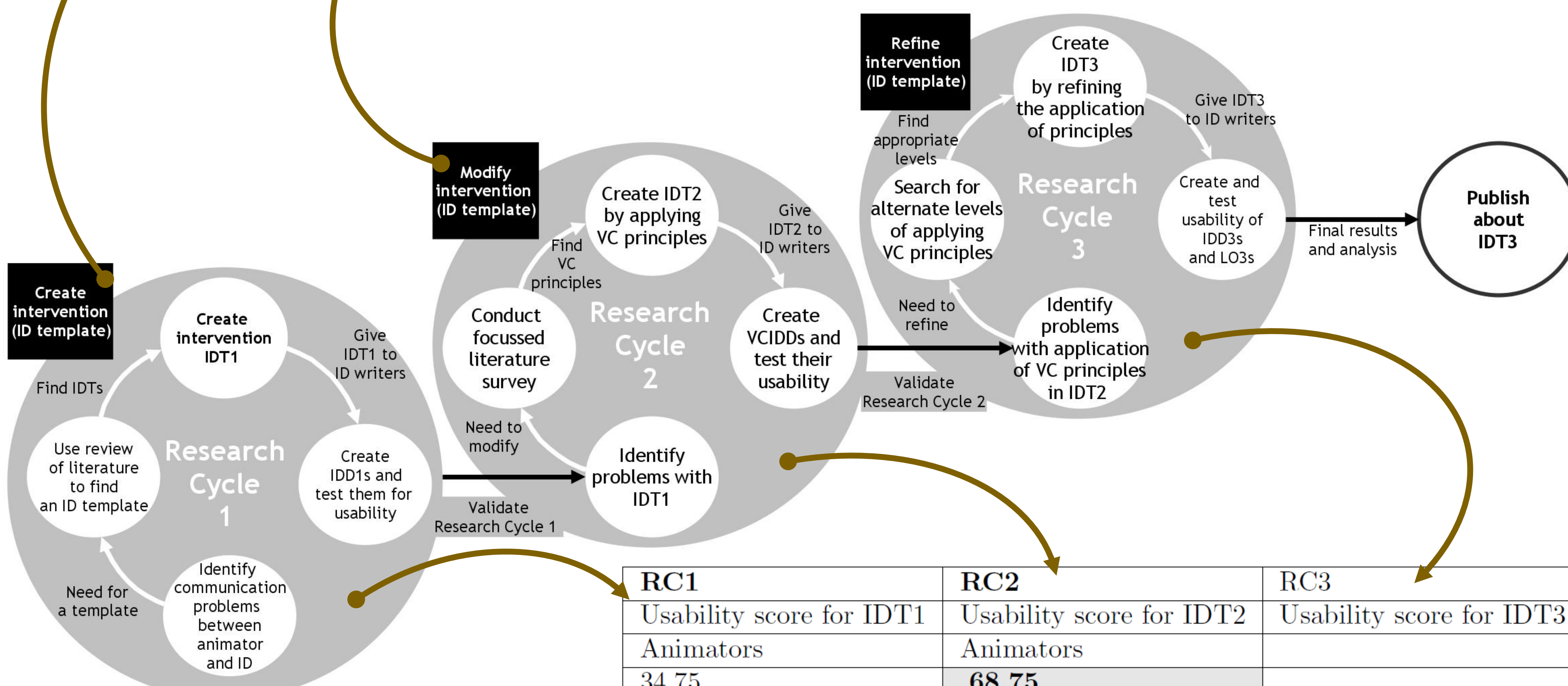
- Do ID writers find our ID templates having VC principles usable?
- Do animators find IDD created by the above ID writers usable?
- Do students find the LOs created by the above animators usable?



Goal
Devise a **methodology** to create usable Learning Objects without having the dependency on the face-to-face interaction between the stakeholders.



RC	Template	Stakeholders	Artefacts	Results	Modifications
RC1	IDT1	Animators	10 IDD1s	IDD1s not usable	Modify IDT1 by adding VC principles
RC2	IDT2	Animators	12 IDD2s	IDD2s are usable	-
		ID writers	12 IDD2s	IDT2 is not usable	
RC3	IDT3	ID writers	14 IDD3s	IDT3 is usable	



RC1	RC2	RC3
Usability score for IDT1	Usability score for IDT2	Usability score for IDT3
Animators	Animators	
34.75	68.75	
	ID writers	ID writers
	54.16	69.42

Methodology

Research Cycle 1: Stages

- 1: Identify problem:** Communication gap between the animator and the ID
- 2: Identify tentative products:** Literature review of ID templates, interviews conducted of ID writers
- 3: Create tentative products and theories:** Created IDT 1 based on literature review and industry practices
- 4: Prototyping and assessment:** Collecting feedback about IDTs created using IDT1. In this cycle, the problem was identified, and need for the intervention was established. First version of the intervention, IDT1 was created, and its' usability was tested for the animators. The results showed that IDT1 was non-usable for the animators in its' current form.

Research Cycle 2: Stages

- 1: Identify problem:** Need for reorganization and textual detailing
- 2: Identify tentative products:** review of prominent principles from visual communication domains: Animation, Graphic design, Interaction design, and Multimedia
- 3: Create tentative products and theories:** Created IDT2 by operationalizing visual communication (VC) principles
- 4: Prototyping and assessment:** IDT2 was found usable for animators, but, NOT for the ID writers. The challenge was to address the problems of the ID writers & refine IDT2, without reducing the visual information present.

Research Cycle 3: Stages

- 1: Identify problem:** Disconnect in the visual and textual description, ID writers unable to write certain details, Unable to understand the relationship between the elements of the animation.
- 2: Identify tentative products:** Inclusion of a checklist, Instruct animator to go through the references
- 3: Create tentative products and theories:** Created IDT3 by advanced application of VC principles
- 4: Prototyping and assessment:** IDT3 was usable for ID writers

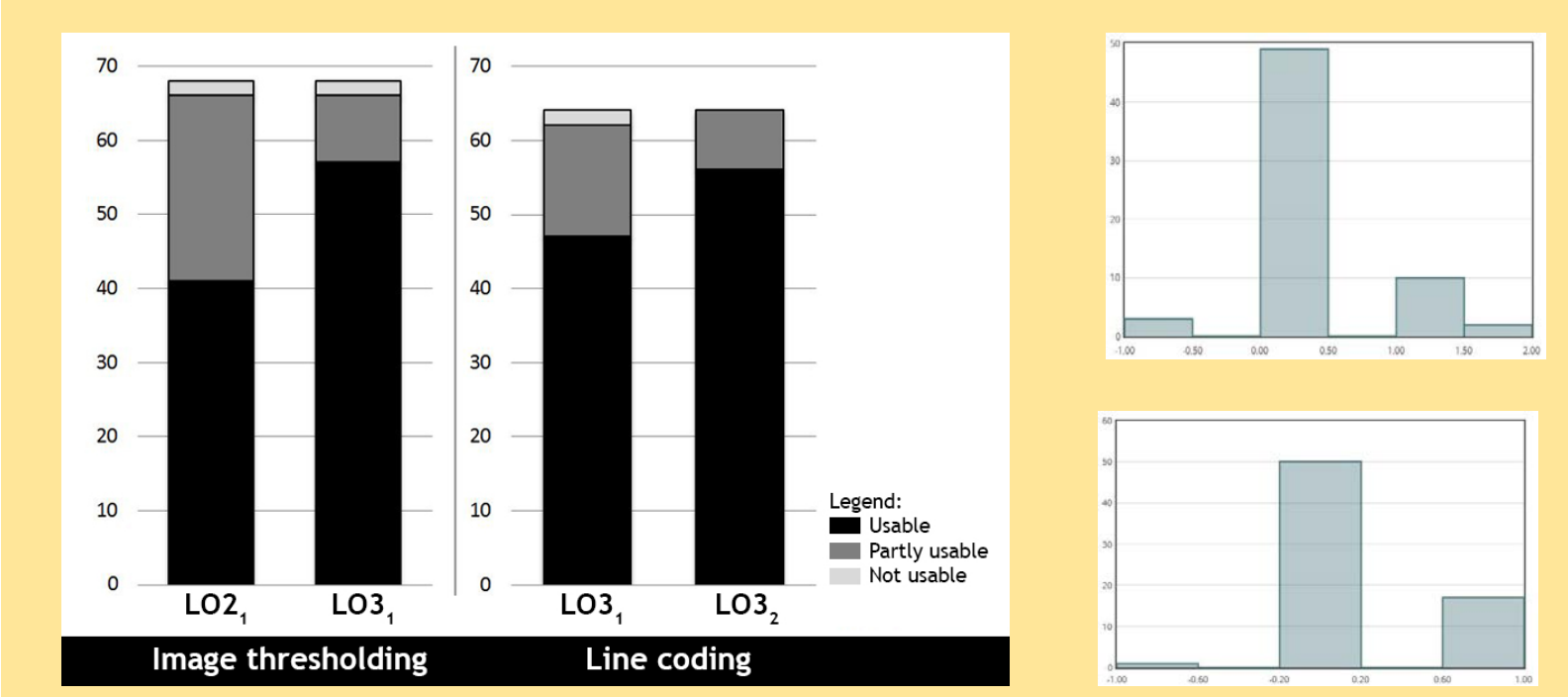
CONTRIBUTIONS

1. Identifying the VC principles applicable for LO creation
2. Operationalizing the VC principles in an IDT
3. Refining the operationalization of VC principles so that the ID writers find it usable.
4. Creating feedback instrument having usability and engagement constructs and validating it.

Final Experiment comparing outputs of IDT2 & IDT3: LO2 & LO3

Usability study: LO3s significantly usable than LO2s ($p=0.000$; $z=-3.771$ for topic 1 & $p=0.016$; $z=-2.399$ for topic 2). **The findings of this research confirms the theory, of adding VC principles makes the product usable.**

Statements	Results of the 2 related sample			
	Non parametric test (Wilcoxon matched pair signed rank test)			
	LO topics: Image thresholding (LO2 ₁ and LO3 ₁)		Line coding (LO2 ₂ and LO3 ₂)	
	p values		z scores	
S1	0.000	0.023	-3.704	-2.675
S2	0.000	0.317	-3.874	-1.000
S3	0.005	0.006	-2.777	-2.739
S4	0.002	0.025	-3.106	-2.236
S5	0.002	0.038	-3.116	-2.071
S6	0.030	0.004	-2.324	-2.858
S7	0.000	0.016	-3.771	-2.399



Student engagement: LO3 is engaging as compared to LO2

Perceptions of teachers (SMEs) on usefulness of LO3s (for learning):
- Interactivity creates a 'what if' scenario for the students
- Instantaneous visual feedback is preferable

Publications

1. Sahasrabudhe, S., Murthy, S., & Iyer, S., Applying Design Based Research to create Instructional Design templates for learning objects. *New Frontiers in Education*, Vol. 46 (1), Jan-Mar 2013, pp. 27-46, ISSN: 0047-9705
2. Sahasrabudhe, S., Murthy, S., & Iyer, S., Applying traditional animation principles for creating learning objects. *New Frontiers in Education*, Vol. 45 (2), Jul-Sep 2012, pp. 81-99, ISSN: 0047-9705
3. Sahasrabudhe, S., Murthy, S., & Iyer, S. (2012). Embedding visual communication principles in Instructional Design phase of Learning Object creation process. In *World Conference on Educational Multimedia, Hypermedia and Telecommunications* (Vol. 2012, No. 1, pp. 1189-1198).