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Challenges in understanding, using, and teaching design methods: perspectives of design educators

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ABSTRACT: This study identifies the challenges design educators face in understanding, using, and teaching design methods and derives features from these challenges for an enhanced methods repository to support design practice and pedagogy. Interviews with 21 educators yielded 14 distinct themes of challenges, based on which the following features are proposed: (a) detailed method information with context-based recommendations and teaching resources, (b) a platform to learn and practice with guidance, and (c) step-by-step walkthroughs with cross-disciplinary examples.

KEYWORDS: design methods, design tools, design educators, design method repository

1. Introduction

A design method is a prescriptive plan of action to enable tasks in designing (Cross, 1993; Wallace, 2011). The effectiveness of design methods in improving product quality, reducing time to market, enhancing the experience of existing products, and formalizing and externalizing the design process is widely reported (Cross, 1993; Guertler, 2018; Jagtap et al., 2014). Notwithstanding their importance, their uptake in industry remains low (Becerril et al., 2019; Eisenmann & Matthiesen, 2020; Jagtap et al., 2014). Design students act as a bridge between academia and industry for method dissemination as they learn methods in academia and use them in industry after graduation (Jänsch & Birkhofer, 2007); this helps in propagating the use of methods. So, design educators play an important role in helping students understand and use design methods. It is important to understand the pedagogy and challenges faced by educators when teaching design methods. In this study, perspectives from design educators on the challenges they face in understanding, using, and teaching design methods are captured. These perspectives will be used in the development of an enhanced repository of design methods, and design educators are one of the stakeholders in this development. The overall goal of this research is to develop and validate an enhanced repository of design methods to support design practice and pedagogy.

2. Literature review

Although design methods are useful to aid designing, their dissemination and acceptance in industries is low; plausible reasons are: the complexity of methods, inflexibility of methods, and lack of expertise about how methods can be appropriately integrated in designing (Albers et al., 2014; Eisenmann & Matthiesen, 2020). To improve their dissemination, facilitate appropriate selection and correct use, and provide information in a compact manner, repositories of design methods are developed (Acharya et al., 2018; Vroom & Olieman, 2010). Mayookh and Srinivasan (2023) reviewed 16 repositories of design methods based on the following 7 criteria: (a) intended purpose of repository, (b) number of design methods included, (c) ontologies used to structure repository and information within design methods, (d) accessibility, (e) supplementary aids used, (f) modality of methods' description, and (g) unique features of the repository to aid design practice and pedagogy. They reported that there is a need for an open-access and user-centric repository to support design practice and pedagogy, in both industry and academia. To develop such a repository, it is important to identify the needs of its potential stakeholders,

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i.e., design students, practitioners, and educators. The needs for such a repository were identified from design students (Mayookh & Srinivasan, 2024) and practitioners (Mayookh & Srinivasan, 2025), by eliciting the challenges they face in understanding and using design methods. Several challenges faced by design practitioners and students in understanding and using design methods were reported. Mosely et al. (2018) identified the following challenges faced by educators in teaching design thinking and methods: communicating with students using a common language, designing content that fits the knowledge level of learners and stimulates their curiosity, and facilitating students to shift from traditional thinking to design thinking. Au and Goonetilleke (2025) opined that teaching and learning design methods is complex and demands significant effort from teachers and students. Diverse student backgrounds, spanning fields like art, engineering, and business, challenge the creation of an inclusive learning environment, and therefore, a tailored approach with multiple teaching formats is essential to meet diverse learner needs. Henriksen et al. (2020) mentioned the following "tensions" faced by design facilitators: teaching students to generate solutions for a problem while also ensuring they do not jump to solutions too soon, and balancing time-constrained activities while simultaneously generating as many solutions as possible. Guaman-Quintanilla et al. (2025) reported that design educators face frustration and confusion because they do not know to structure their courses in the limited available time and to evaluate their students' work. Some challenges in using design methods are: users have their own problem-solving style and do not accept new problem-solving procedures easily because of restrictions, lack of resources (including time), and therefore, are forced to react spontaneously and continue with their time-tested procedures (Birkhöfer et al., 2002). They face complexities due to exposure to an overwhelming set of information, and decisions must be made based on this information (Solterman, 2008). Moreover, design methods lack applicability as they do not acknowledge real-world contexts (Dickson & Stolterman, 2016; Gray, 2016), are complex to use, have theoretical overload, and require considerable effort to implement (Geis et al., 2008). Some other challenges faced by users are how to correctly use them (Hjartarson et al., 2021) and estimating their merit due to lack of practical experience (Birkhöfer et al., 2002). Existing research that attempts to comprehend the issues in teaching, using, and understanding design methods is based on studies from various countries worldwide, but this does not include India. Since the proposed enhanced repository is initially intended for use in India, it is important to understand the perspectives of Indian stakeholders (design students, practitioners, and educators) first. This study specifically focuses on the Indian Design Educators (IDEs). No literature reports the challenges faced by IDEs in teaching, using, and understanding design methods. Even though the challenges faced by Indian design educators (IDEs) in understanding and using design methods may be similar to those encountered by design students or practitioners (Mayookh & Srinivasan, 2024, 2025), it is important to capture the perspectives from the educators as the teaching, guiding, advising and mentoring experiences may bring new perspectives. Based on these gaps, the objective of this study is to identify the challenges faced by IDEs in understanding, using, and teaching design methods, and from these challenges identify features to be incorporated in the enhanced repository.

To accomplish this objective, this study aims to answer the following research questions:

RQ1: How do design educators teach design methods, and what information about methods do they provide to their students to enable them to understand and use methods?

RQ2: What challenges are faced by design educators in understanding, using, and teaching design methods?

RQ3: Is there a need for an intervention to support teaching, learning, and practicing design methods? If so, what features would design educators expect to have in such an intervention?

3. Research methodology

To answer the research questions, 21 IDEs are interviewed through in-person, online, and telephonic modes. The interviewees have experience in teaching courses involving implementation of design methods in the range of 2-17 years (median experience of 6 years) in a Centrally Funded Technical Institution (CFTI), a National University (NU), a State Funded Technical Institution (SFTI), Private Institution (PI), or an Online Learning Platform (OLP). The IDEs associated with CFTIs, NUs, SFTIs, and PIs teach or have taught in the following disciplines: Mechanical Engineering, Applied Mechanics, Industrial Design, Fashion & Apparel Design, Interior Design, and Architecture & Planning, and to students of the following programs: Bachelor of Design (B.Des), Bachelor of Technology (B.Tech), Bachelor of Arts (B.A), Master of Design (M.Des), Master of Technology (M.Tech), and Doctor of philosophy (PhD) programs. Out of the 21 IDEs, 12 have a PhD, 7 have a M.Des, 1 has a M.Tech, and

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1 has a M.Sc as their recent educational degree. The IDEs were recruited through purposive sampling via the authors' academic networks, based on their experience in teaching design methods. The interviews are semi-structured (see Appendix A for the list of questions), with a duration of approximately 40 minutes each. The interviews are recorded and transcribed using MS Stream and MS Word, for analysis. The transcribed data of each IDE is summarised based on the following categories (see Table 2), i.e., the responses of IDEs, to the questions asked in the interview (see Appendix A), were mapped to their corresponding categories: (a) teaching methodology, (b) information content of methods, (c) challenges in teaching, (d) challenges in understanding, (e) challenges in using, (f) perception on the need for intervention, and (g) expected features of intervention. The responses under each of these categories are clustered into different themes based on similar meanings, underlying ideas, or challenges. This category mapping and the subsequent clustering of categories into themes were done by the first author. Thereafter, the themes of the challenges faced in teaching, understanding, and using design methods are translated to features for the enhanced repository. The features explicitly shared by IDEs for the enhanced repository will be the second source of input, reflecting their priorities, perceived needs and wishes- elements that cannot be inferred from the challenges alone.

4. Results

A summary of the transcribed data is shown in Table 1. The transcribed data of interviews is analysed and thematic analysis is conducted by clustering data that is similar.

Table 1. Summary of responses of IDEs

Educators	Teaching methodology	Information on methods	Challenges in teaching	Challenges in understanding	Challenges in using
IDE1	- Theory-based - Practice through projects - Exam-based assessment	Purpose, steps, examples	Few examples, students confused with design phases	Few examples, less info on methods	Not used
IDE2	- Practice-based - Project-based learning + assessment	Motivation, steps, output, examples	Understanding projects, example replication by students, biases due to prior education, do not value design processes	Deriving actionable brief from data, biases towards methods	No challenge
IDE3	- Practice-based - Assignment + project-based assessment	Steps, importance, history	Limited guidance, teaching personal reflection, exposing to all method types, overconfidence in students	No common vocabulary, no methods for some tasks, appreciating methods take time	Constraints like funds and time, testing usability, using methods in best possible way
IDE4	- Theory-based - Exam-based assessment	Steps, examples	Method practice requires time, complicated to understand, scarcity of examples	Method use situation, reason for preference	No challenge
IDE5	- Theory + practice + reflection - Project + assignment-based assessment	Context, input-output, examples	Incorrect method use, students copying examples	Context of use, preference for simpler methods (low complexity), no feedback	No challenges

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Table 1. Continued

Educators	Teaching methodology	Information on methods	Challenges in teaching	Challenges in understanding	Challenges in using
IDE6	- Project-based learning + assessment	Examples	Method fixation	No challenge	Ambiguity to underlying assumptions, context of use
IDE7	- Project-based - Project + exam-based assessment	Steps, design phase, examples	Students do not value methods, do not use methods properly, appropriate situation for a method use	Which context suits method, less practice, no guidance	No challenges
IDE8	- Theory-based - Learning by doing - Project-based assessment	Objective, steps, examples	Teaching UG students, data interpretation	No challenge	Method prerequisites, ensuring correct use
IDE9	- Theory-based - Projects - Assignment + exam-based assessment	Objective, steps, benefits, input, output, design phase, examples	Limited time to teach methods, limited examples	No feedback	No feedback
IDE10	- Theory-based - Projects based practice - Peer-assessment based on project	Steps, examples	Selecting methods based on problem context, lack of examples	Curating info on methods, using methods properly	Methods are formal, best method combination based on problem
IDE11	- Theory-based - Assignment + exam-based assessment	About, steps, literature	Less variety of examples, no appreciation for complex methods, Low confidence, good problem difficult to find	Less examples, in-depth info not available	No challenge
IDE12	- Practice-based - Assignments + projects- based assessment	Examples	Method preferences of students, idea fixation	Teachers unable to provide solution	Teachers unable to provide solution
IDE13	- Practice-based - Project + assignment-based assessment	Examples	To get desired output, data interpretation, working with real users	Practice required, less examples, few methods for finding user requirements	Method use in different media
IDE14	- Lecture + practice based - Project-based assessment	Examples	Unique problem of each student	No challenge	No challenge
IDE15	- Theory-based - Exam-based assessment	Principles, steps, examples	Testing method knowledge, using methods correctly	No challenge	No challenge
IDE16	- Practice-based learning + assessment	Steps	Collecting teaching material, unique challenges of each student, less examples of different variety	Less examples, info not research based	No challenges

(*Continued*)

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Table 1. Continued

Educators	Teaching methodology	Information on methods	Challenges in teaching	Challenges in understanding	Challenges in using
IDE17	- Theory + practice- based - Assignment + exam-based assessment	Objective, example, steps	Constraints like time, resources, etc.	No challenge	Not used in practice
IDE18	- Theory-based - Project- based practice - Assignment + exam-based assessment	Objective, example, steps	Suitability of context for a method, data interpretation	Less examples	Interacting with stakeholders, lack of practice
IDE19	- Theory-based - Project- based learning - Assignment + exam-based evaluation	Objective, example, steps	Scarcity of domain specific examples, engaging students, need for students specific teaching method	Less time for practice, non-design background requires practice	Dealing users and their biases
IDE20	- Practice-based learning - Assignment and exam-based assessment	Objective, example, steps	Visualising design process, building confidence and trust in methods	No challenge	Suitability of a method to a problem context
IDE21	- Theory-based - Project- based practice - Assignment and exam-based assessment	Objective, example, steps	Scarcity of examples	No challenge	No challenge

Table 2 shows the various aspects of teaching methodology adopted for teaching design methods. Design methods are taught using sessions of theory, practice and their combination. Majority of IDEs report teaching through a practice focused methodology (e.g. "... focus less theory ... and more practice"- IDE3). Theory-based approach is largely classroom-centred, emphasizing design method understanding through the delivery of theoretical content. In contrast, practice-based approaches prioritize experiential learning, where students learn design methods through hands-on activities such as projects, and assignments. The assessment of teaching is through quizzes, exams, weekly assignments and projects (e.g. "... I give semester long group projects for practical exposure"- IDE1, "... conduct written exams for testing method knowledge and use"- IDE1). Some IDEs assess based only on exams and quizzes (14.2%), while some use both projects and assignments (47.6%), and the remaining use both methods of assessment (38%).

Table 2. Teaching methodology used by IDEs to teach design methods

Teaching Methodology	Frequency
Focus less on theory, more on practice	15
Provides semester-long projects	11
Project work and assignments-based learning assessment	10
Learning assessment through both exams and project work	8
Focus on method theory	6
Written exam, and quiz-based learning assessment	3
Self-exploration by students/ student reflection	2

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Table 3 shows the various facets of information of design methods that are used in the teaching. Most IDEs use information of objectives, purpose, principles, steps, examples, and case-studies of design methods.

Table 3. Information on design methods communicated to students by IDEs

Information content	Frequency
Examples/ Case studies	18
Steps	16
Method objective, purpose, principles	11
Miscellaneous: History, literature, design phase	3
Context of use	2
Input and Output	2

After clustering the transcribed data of interviews, the following themes emerge in the challenges faced by IDEs in understanding design methods (see Table 4): Lack of design methods or lack of information on methods for a given task (such as "lack of methods for understanding user requirements"- IDE13), Choosing design methods based on the problem context (such as "which method can be used in what kind of situation?"- IDE4), Scarcity of examples of method use (such as "... scarcity of good, detailed examples"- IDE11), Weak method understanding due to less practice (such as "... do not have a background in design, ... new to methods, ... required a lot of practice to build understanding"- IDE13), No guidance or feedback on method use (such as "... no guidance on how to use methods properly and what to avoid"- IDE7), and Biases towards certain methods because of the background or prior education or the users (such as "... had biases when introduced to methods, ... had to relearn designing"- IDE2). A considerable set of IDEs report facing no challenges in understanding design methods.

Table 4. Themes of challenges faced by IDEs in understanding design methods

Challenges (Theme)	Frequency
No challenges faced	7
Lack of methods/ information on methods for a given task	6
Scarcity of examples of method use	5
Choosing methods based on problem context	5
Weak method understanding due to less practice	4
No guidance/ feedback on method use	3
Biases towards methods because of their background/ prior education	3
Do not appreciate the importance of methods	2
Finding information on methods to (learn to) use them	1

The analysis of data reported on the challenges in using design methods reveals the following themes (see Table 5): Choosing methods based on the problem context (such as "... how to know which method is good for which kind of problem"- IDE20), Ensuring correct use of method (such as "... how to ensure correct usage of methods for best results"- IDE8), and Inherent limitations of design methods and the user (such as "... hesitation in interacting with stakeholders"- IDE18 and "methods too formal to be used in real problems"- IDE10). A significant number of IDEs reported facing no challenges in using design methods.

Table 6 shows the themes emerging from the analysis of transcribed data describing the challenges faced in teaching design methods: Students fixate on some design methods, they do not understand the importance of or trust design methods (such as "students fixated on some methods, don't want to use other methods"- IDE6 and "students do not understand the importance of methods in designing ..."- IDE7); Limited guidance can be provided to students due to constraint of time (such as "methods are time time-consuming in practice, ... require extra time apart from class"- IDE4); Scarcity of examples of method use for one to

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teach (such as "Not enough good examples of different varieties . . . to teach"- IDE1); Biases in students towards certain design methods because of their background or prior education (such as "different students need to be taught through different teaching methods . . . because of their background"- IDE19); Confusion among students about the correct situation, domain, and design phase of method use (such as "students get confused and mix-up methods of different design phases"- IDE1); Incorrect method use because of lack of practice, or overconfidence in students (such as "students are often overconfident in applying methods, . . . do not use them properly"- IDE3); Teaching students how to get desired output from a design method and interpretation of data/ output (such as " . . . difficult to teach how to make sense out of data"- IDE8); and Finding good problems for assignments and tests, and engaging teaching material (such as "difficult to find good problems to give to the students to work on"- IDE11).

Table 5. Themes of challenges faced by IDEs in using design methods

Challenges (Theme)	Frequency
No challenges faced	9
Choosing methods based on the problem context	4
Ensuring methods are used correctly	3
Inherent limitations of methods and user	3
Never used in practice	2
Finding info on method pre-requisites and assumptions	2
No guidance/ feedback on method use	2
Constraints like funds, time, etc.	1

Table 6. Themes of challenges faced by IDEs in teaching design methods

Challenges (Theme)	Frequency
Students fixate on some methods, don't understand the importance of, or trust design methods	8
Limited guidance provided to students due to constraint of time	7
Scarcity of examples of method use	6
Biases in students towards methods because of their background/ prior education	6
Confusion among students related to situation, domain, and design phase of method use	4
Incorrect method application due to lack of practice, or overconfidence	4
Teaching how to get desired method output and data interpretation	3
Finding good problems, and engaging teaching material	3
Students copy/replicate the examples taught	2
Each students have their unique set of challenges	2
Teaching skills like visualizing design process, personal reflection	2
Teaching undergrads is difficult due to lack of maturity	1

In the aspect of a need for intervention to augment teaching, 80% of the interviewed IDEs reported the need for an intervention to help teach, learn, and use design methods in academia, 14% are unsure and the remaining 6% opine that there is no need for a new intervention as the existing resources are sufficient if used effectively. The outcomes from the thematic analysis (shown in Tables 2-6) of the challenges faced by IDEs in understanding, using and teaching design methods, are used to identify features for the envisioned enhanced repository (see Table 7). In addition to this list, the IDEs who felt the need for an intervention to assist in understanding, using and teaching methods, explicate the features they would wish to have in the enhanced repository (see Table 8). Some features are rooted in the challenges the IDEs faced or face in understanding, using and teaching design methods. Some features are pure wishes as they are not connected directly to any challenges or needs of IDEs, yet these features are worth reporting and implementing in the envisioned enhanced repository because these features reveal the aspirations of IDEs, highlight opportunities for innovation and help ensure long term relevance of the

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repository. These features are: (a) multilingual information; (b) standardization of design terms/ vocabulary, upgradability - addition of new methods; (c) assistance in teaching/engaging study material for students/courses on design methods; (d) reliable (source of) information/literature; platform to store data/ repository of open-source data/ support for data interpretation; and (e) redesigned methods based on industry needs.

Table 7. Features derived from challenges

List of challenges (themes)	Derived features
Lack of methods/ information on methods for a given task	Detailed information on methods (such as appropriate situation(s)/context(s) for a method's use, and examples), with an intervention for method recommendation based on problem context, and a repository of teaching material and design problems
Choosing methods based on problem context	
Scarcity of examples of method use	
Confusion among students related to the correct situation, domain, and design phase of method use	
Finding good problems, and engaging teaching material	
Weak method understanding due to less practice	A platform to learn and practice design methods with guidance and feedback
No guidance/ feedback on method use	
Ensuring methods are used correctly	
Limited guidance provided to students due to constraint of time	
Incorrect method application due to lack of practice, or overconfidence	
Teaching how to get desired method output and data interpretation	
Biases towards methods because of their background/ prior education	Step-by-step guided method walkthroughs and examples from multiple disciplines (The two features stated above also address these challenges)
Inherent limitations of methods and user	
Students fixate on some methods, do not understand the importance of, or trust design methods	

Table 8. Features expected by design educators

Expected features	Frequency
Detailed examples for a variety of contexts - design situations, disciplines, design phases	8
Detailed information on methods, including alternate methods, degree of difficulty, and method context	7
Platform to discuss methods/share experience/for students to share and discuss problems/to get feedback on method use	6
A method filtering mechanism or method recommendation based on problem context	5
Assistance in teaching/ engaging study material for students/ courses on design methods	5
Variety of methods covering all design activities/ feature to add own method	4
Reliable (source of) information/ Literature such as books, and research papers	2
Platform to store data/ repository of open-source data/ support for data interpretation	2
Platform for practice	2
Multilingual information	1
Standardization of terms, a common vocabulary/language in design	1
Upgradability - addition of new methods	1
Redesign methods based on industry needs	1

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5. Discussion

The objectives of this study are to identify the challenges faced by IDEs in understanding, using and teaching design methods, and from these derive features for the envisioned enhanced repository of design methods. The challenges in understanding, using and teaching design methods are categorised under various themes after analysis of the transcribed data of interviews. The following features are derived from the challenges: (a) detailed information on methods, with an intervention for method recommendation based on problem context, and a repository of teaching material and design problems, (b) a platform to learn and practice design methods with guidance and feedback, and (c) step-by-step guided method walkthroughs and multidisciplinary examples. This study also shows that 80% of the interviewed IDEs report the need for an intervention to help teach, learn, and use design methods and a significant number of IDEs expect to have the following features in this intervention: detailed examples for a variety of contexts (design situations, disciplines, design phases); detailed information on methods, including alternate methods, degree of difficulty, and method context; platform to discuss methods/ share experience/ for students to share and discuss problems/ to get feedback on method use; a method filtering mechanism or method recommendation based on problem context; assistance in teaching/ engaging study material for students/ courses on design methods; and a variety of methods covering all design activities/ feature to add own method. This study also shows that majority of IDEs prefer a practice-based methodology to teach design methods along with a project/assignment-based assessment. The challenges identified in this study are similar to some reported in literature (Au & Goonetilleke, 2025; Birkhöfer et al., 2002; Guaman-Quintanilla et al., 2025; Henriksen et al., 2020; Hjartarson et al., 2021; Mosely et al., 2018), such as: communicating with students using a common language, diverse student backgrounds challenge the creation of an inclusive learning environment, ensuring students do not jump to solutions too soon, how to evaluate their students' work, balancing time-constrained activities, lack of resources including time, how to correctly use design methods, difficulty in estimating their merit due to lack of practical experience. So, the list of features derived from the identified challenges can also serve as solutions to the challenges reported in literature. This study is the first attempt to understand the teaching methodology and identify the challenges faced by IDEs in understanding, using, and teaching design methods in design schools in India. Given the proliferation of design and design research education in India in the last decade or so, this endeavour is an important step in improving the quality of education.The other significant aspect is the discovery of novel features for the enhanced repository not found through earlier studies. The primary limitation of this study is that only 21 design educators are interviewed, and this may not be representative of the IDEs. The IDEs teach in different kinds of institutions (CFTI, NU, SFTI, PI and OLP) which have different mechanisms to admit students in their design programme and the teaching (including the assessing) methodology is different due to the autonomy of the Institutes. The IDEs are from a variety of disciplines such as engineering, design and architecture, and their education on design methods are from institutions of different tiers. This may have also influenced their teaching methodology. However, these significant variables are not considered in this study, primarily due to lack of sufficient number in each category. However, the enhanced repository, for which the inputs are taken, is intended for educators, students, and practitioners, irrespective of their affiliations or institutions. The findings of this study, along with those of empirical studies conducted with design students (Mayookh & Srinivasan, 2024) and practitioners (Mayookh & Srinivasan, 2025), are used to identify the features of the enhanced repository. These studies, along with the theoretical (Mayookh & Srinivasan, 2023) and empirical reviews (Mayookh & Srinivasan, 2025) of the existing repositories of design methods, will be used for the development of the enhanced repository of design methods to support design practice and pedagogy.

6. Summary and conclusion

The objectives of this study are to identify the challenges faced by the Indian Design Educators (IDEs) to understand, use and teach design methods, and from these challenges to derive the features of an enhanced repository of design methods to aid design practice and pedagogy. To do these, data from the interviews of 21 IDEs is used. Analysis of transcribed data of interviews reveals various themes of challenges faced by educators. These are used to derive the features of the enhanced repository, in addition to the features shared by the IDEs in their interviews. The interviews of the IDEs help identify important themes of challenges faced by educators in understanding, using, and teaching design methods.

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Further, these challenges helped discover important and novel features of the envisioned, enhanced repository of design methods.

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Appendix A

Following is the questionnaire for the interview:

1. What is your name and educational qualification?
2. Where do you teach, and how many years of experience do you have in teaching courses involving design methods?
3. How do you teach design methods? What teaching methodology do you use?
4. What information do you provide to your students on design methods to ensure they understand methods completely and to enable them to use methods correctly?
5. What challenges did you face in teaching design methods?
6. How were you taught design methods when you were a student?
7. What challenges did you face in understanding design methods?
8. What challenges did you face in using design methods?
9. Is there a need for an intervention to teach, learn, and use design methods in academia? If so, what features would you expect to have in it?

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