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DIPF Open Science Codex

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Kontakt / Contact:

DIPF | Leibniz-Institut für
Bildungsforschung und Bildungsinformation
Frankfurter Forschungsbibliothek
publikationen@dipf.de
www.dipfdocs.de

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DIPF Open Science Codex

The Open Science Codex was adopted by the full Executive Board at DIPF on January 23, 2024 with immediate effect. The Open Science Codex replaces the Open Access Policy from 2016 and the Open Data Policy from 2020.

Content

A. Preamble

By signing the Open Science Codex, DIPF, as a member of the Leibniz Association (WGL), commits to the basic principles and practices of open science, with the aim of transparent, reproducible and reusable research and the participation of society in science.

DIPF sees the opening of science as part of good scientific practice and promotes a culture of open science at the institute, the expansion of infrastructures and services for educational research to implement open science practices and networking with open science initiatives to find solutions in order to establish open science as a standard.

The commitments set out in the Open Science Codex include all research disciplines as well as practices of research support, infrastructure development, science communication and transfer at the institute.

The Open Science Codex applies to all DIPF employees. In the case of externally funded projects and projects with external partners, any of their regulations regarding the publication, access and archiving of research and respective products is also considered.

The Open Science Codex is divided into three sections:

- Part A expresses what DIPF' means by Open Science and its goals as well as referring to existing guidelines.
- Part B expresses the dimensions of Open Science relevant to DIPF and their implementation by employees and the institute
- Part C expresses the strategic development of Open Science at DIPF.

[Links to referenced documents can be updated to keep them up to date without the Codex having to be newly adopted. This also applies to new versions of the referenced documents.]

What is meant by Open Science and its goals

Digital innovations and infrastructures make it possible to open up science more consistently in order to improve accessibility, transparency, comprehensibility and reusage. This also helps to promote science communication, the transfer of science to society and participation of society in science. Open practices relate to the implementation of measures that realize this development and ensure good scientific practices. These practices relate to all research disciplines involved, conduct of scientific research and all forms of science communication and science transfer. Open Science (also known as Open Scholarship) thus encompasses all scientific paradigms and therefore does not only focus on quantitative empirical research.

By commitment to the Open Science Codex, DIPF employees agree to implement open practices in their various dimensions and contexts and to further promote them in science and its communication, transfer and participation.

The Open Science Codex thus acts upon the strategic establishment of open practices set out in the Leibniz Open Science Policy (signed in November 2022).

By implementing the Open Science Codex, DIPF pursues the following goals:

- opening up research and reducing inequalities in access to science by providing and simplifying access to findings, data and methods,
- quality assurance of research through transparency and verifiability of findings, data and methods,
- dissemination of knowledge through the promotion of science communication and science transfer,
- optimized use of resources and increase innovative capacity by reuse of research,
- promoting open practices by raising awareness, providing advice and offering training,
- promoting open practices through innovative development, expansion and sustainable provision of infrastructures and services for employees and educational researchers,

- actively supporting the open science transformation through networking and cooperation with stakeholders from national and international open science initiatives.

Given the limits to openness for legal, ethical or moral and economic reasons, among others, DIPF aims to establish open practices as the standard, but to allow closed practices whenever necessary. This means acting according to the principle of "as open as possible, as closed as necessary".

FAIR principles and existing guidelines

Whenever possible, the provision and sharing of research and its products should always follow the FAIR principles. The FAIR principles were developed for research data but they can also be applied to other dimensions of Open Science and its products, such as publications (of results, data and transfer), research designs, methods and survey instruments, teaching materials, information materials and knowledge transfer materials, software, code and resulting infrastructures. FAIR translates into **F**indable, **A**ccessible, **I**nteroperable and **R**eusable. Accordingly, research products should be described and made available in such a way that they can be easily found by potential users: They need metadata allowing finding via search engines or directories.

- They are accessible to potential users with as few restrictions as possible: They should not be restricted by technical barriers or license conditions.
- They can be processed by potential users in the long term using common programs and standards: The metadata and documentation are sufficient to ensure that the methods and procedures used in the research can be understood.
- They can be reused by potential users: They are provided in an understandable and preferably open format and sufficient metadata and documentation are given to understand and use them.

At an institute level, the Open Science Codex is directly linked to the strategy paper "Knowledge about education. DIPF strategy until 2027" (German: "Wissen über Bildung. Die Strategie des DIPF bis 2027"), which defines Open Science as a key strategic focus. Together with the "Leibniz Open Science Policy" published by the Leibniz Association, the Open Science Codex creates concrete guidelines and points of reference for DIPF employees at institute level. In addition, the Codex complements and enforces the "Rules for Safeguarding Good and Transparent Scientific Practice" (German: "Regeln zur Sicherung guter und transparenter wissenschaftlicher Praxis"; as of 2022).

B. Dimensions and joint implementation

In order to achieve the Open Science goals set by DIPF, the following measures based on the principle of "as open as possible, as closed as necessary" are targeted. DIPF and its employees endeavor to ensure that their actions are always in line with the postulations of the Open Science Codex. The Institute encourages its employees to implement these practices as best as they can. The continuous improvement of support for employees in the implementation of Open Science as well as the joint exchange on framework conditions are part of this joint implementation.

Open Access publications

Open access refers to free access to digital scientific publications via the internet, unhindered by payment barriers or registration. The rights of use for open access publications are regulated transparently via so-called free licenses (e.g. Creative Commons Licenses). Author copyrights, such as the protection of intellectual property or the right to quote, are also protected in open access publications in accordance with copyright law.

Open Access encompasses the entire range of publication formats (articles in journals and anthologies, monographs, reports, etc.) and does not exclude a parallel printed edition, for example in the case of book publications. In addition to Open Access first publications, preprints or second publications parallel to conventional publishing are widespread; however, due to legal restrictions, these may often not correspond to the final publisher's version or there night be a time delay to the original publication.

Open Access publications are made permanently technically available and accessible by publishers and via Open Access repositories supplied by subject communities or institutions. The metadata for the publications should also be freely accessible in standardized formats and reusable without restrictions in accordance with the FAIR principles.

DIPF and its employees aim to make the publications produced at the institute freely accessible under a clear license and to further promote the transformation to Open Access.

The employees are responsible for ensuring that

- all options for making their publications open access are consistently pursued.
- preferably the first publication is already Open Access; where this is not possible or does not seem sensible for reasons of content, an Open Access self-archiving of the preprint or postprint version is realized.
- the typescript version is published before peer review as a so-called preprint paper on a specialized preprint archive for the purpose of faster dissemination, reception and commentary by the scientific community, insofar as this is the recognized practice in a scientific discipline.
- if possible, scientists version files containing their texts and save them continuously so that manuscript versions from the preprint and postprint peer review phases are available for the purpose of self-archiving and for the traceability of the publication process.
- the legal rights of use for their open access publications are clearly and transparently regulated by standardized and open licenses (e.g. Creative Commons licenses).
- Open Access publications can be permanently accessed via persistent identifiers (e.g. DOI, URN).
- employees promote open access in their role as an editor.
- they take open access principles into account when acting as a reviewer.
- all options for acquiring publication funds are exhausted in the context of external funding applications.
- they do not publish with publishers that engage in predatory publishing, i.e. fraudulent business practices.
- they comply with DIPF regulations on publication expenses and price limits.

The institute ensures that

- principally all Open Access publication costs of employees are covered if the current conditions for cost coverage are met and if no own publication funds are available from project sources. Funding is provided from central funds (DIPF-OA publication budget), regularly reviewed and adjusted.
- the institutional Open Access repository DIPFdocs provides all employees with a platform for publishing Open Access preprints or Open Access secondary publications.
- educational science literature by DIPF employees and German educational researchers is published via peDOCS – an open access repository - and is available on a long-term basis (including DOI allocation, long-term archiving).
- the dissemination of Open Access publications from educational researchers and DIPF to the scientific communities and the general public is guaranteed by referencing the titles in specialist bibliographic databases (e.g. FIS Bildung), in the Institute's publication database, in the Open Access portal of the Leibniz Association (LeibnizOpen) and by making them findable in search engines.
- at DIPF, employees are informed about all aspects of open access publishing in suitable formats (e.g. via the intranet or in workshops) and they receive further training in this regard.
- an Open Access representative advises employees individually on open access publishing issues.
- the range of open access publications in specialist journals is expanded and the switch to open access business models is promoted by so-called transformation agreements with academic publishers.
- new Open Access publications and publication processes are supported by publication platforms.

Open and FAIR Data

According to the DFG definition, research data refers to all instruments and data that are generated, used and/or analyzed in the course of a research process. In order to ensure transparency, traceability, reproducibility, replicability and reusability, this data should be archived and made accessible.

If the data is freely accessible without restriction, it is known as open research data (open data). Since unrestricted access to research data is not always possible or appropriate (e.g. for ethical or data protection reasons), data should be made available as openly as possible while being as closed as necessary. All data, whether restricted or open, should be archived according to the FAIR principles (FAIR Data) in order to optimize the traceability of research and the subsequent use of the data.

DIPF and its employees are striving to make the data generated in a research process accessible to the best degree in order to promote both the transparency and traceability of research and the subsequent use of data.

Employees need to ensure that

- generated and used data are published in a certified research data center or acknowledged repository if possible.
- generated and used data that cannot be published are deposited in the DIPF data archive or an equally qualified archive correspondent to good scientific practice.
- additional information is provided with the data that helps to make the data comprehensible or reusable (e.g. metadata, scale manual, field report).
- research data is published in an ethically and legally secure manner observing the personal rights of study participants, data protection and copyright.
- the current status of specialist guidelines, as issued by the professional associations, is observed.
- published research data can be found and cited via a persistent identifier (e.g. DOI).
- the research data is available in non-proprietary file formats and can be opened or edited with open-source software wherever possible.
- the necessary resources are available for research data management and the publication of research data. Appropriate resources are requested for externally funded projects.
- they correctly cite their own research data and the data of others in their research.
- they enquire about the research data in their role as reviewer unless these are reported in the manuscript.

The Institute ensures that

- organizational and technical infrastructures for research data management are available for its members and German educational researchers in the long term (FDZ Bildung, VerbundFDB) in order to share data and findings with (educational) researchers. Data protection and security are guaranteed from data collection to archiving and, if necessary, transfer to third parties.
- data and findings from research projects can be archived in accordance with good scientific practice after project completion until expiry of the archiving period. This also applies if the responsible project team members change their employer.
- it is involved in overarching and subject-specific initiatives in the field of open and FAIR data in the interest of exchange and networking.
- the research data management advice center offers employees individual advice on questions relating to open and FAIR data. The advice center also runs information events and issues articles for all employees concerned with the topic of research data.

Open Methodology

Open Methodology refers to the transparent, comprehensible, reproducible and accessible presentation of the research methodology used to reach empirical conclusions. Open methodology addresses aspects of the research process from planning (e.g. pre-registration, statistical power) to implementation (e.g. data, research materials, analysis processes, reflection on one's own role) and evaluation through to dissemination (e.g. registered report, reporting of conditions, instruments, processes). The aspects of Open Methodology are thus linked with those of Open and FAIR Data and add further building blocks for opening up the research process.

Open Methodology affects the transparency, intersubjective comprehensibility, reproducibility and replicability of research findings and their interpretation as well as equal opportunities with regard to their reception in different measures depending on the respective scientific discipline and culture.

To implement open methodology, relevant decisions in the research process must be appropriately documented. On the one hand, this documentation takes place internally, for example to ensure professional supervision or project handovers between people. On the other hand, there may be public documentation, for example in terms of scientific publications, where statements should be transparently comprehensible, for example to enable intersubjective traceability and/or reproducibility and replication. In addition to the formal documentation (e.g. analysis scripts), it is essential that a language appropriate to the target group is chosen for the project so that relevant social groups can understand the research process.

DIPF and its employees will strive to always choose and document their methodological approaches in such a way that their research is transparent, comprehensible, accessible and appropriate to the target group.

Employees need to ensure that

- the materials used in research projects and the data analysis are comprehensible, reproducible and publicly accessible via a professional repository in accordance with Open and FAIR Data, in line with relevant licenses. The materials include stimuli (e.g. for treatments), descriptions of the procedure, measurement and data collection instruments (e.g. tests, questionnaires), data preparation codes and analysis files and syntax files.
- all research processes, the persons involved and all methodological processes are documented and reported transparently, completely and comprehensibly during dissemination. At the very least, reference should be made to corresponding reports such as supplements, technical reports or data papers.
- pre-registration of planned studies takes place where possible and appropriate. This applies not only to confirmatory research, but also to exploratory research as well as secondary data and meta-analyses.
- when planning studies where inferential statistical conclusions are drawn, sample size planning follows transparent and comprehensible assumptions regarding expected effect size and test power.
- the option of a registered report (peer review of research design and method) is examined when planning hypothesis-testing studies and, if possible and sensible, targeted.
- the materials are available in non-proprietary file formats and can be opened or edited with open source software if possible.
- Employees enquire about all of the above aspects in their role as a reviewer, insofar as such aspects are not reported in the manuscript.

The Institute ensures that

- the technical requirements for shared versioning and file management systems are in place so that they can be easily connected to suitable software. Employees are offered handouts and training courses.

- space is created for internal quality control (e.g. for an internal peer review of data analysis code) and employees are advised individually on questions relating to Open Methodology.
- employees are informed about all aspects of Open Methodology in suitable formats (e.g. on the intranet or in workshops) and receive further training in this regard.

Open Educational Resources

Ideally, products and materials created in connection with research and the transfer of knowledge from research to practice are accessible free of charge and without restrictions. If they are prepared and published as Open Educational Resources (OER), they have a free license (e.g. Creative Commons) and are accessible and usable without restrictions, i.e. OER can be stored (**v**erwahrt), used (**v**erwendet), processed (**v**erarbeitet), mixed (**v**ermischt) and distributed (**v**erbreitet) in accordance with the [5V principles](#).

Materials created in the context of and in connection with research may address the following areas:

- materials designed for teaching sessions (presentation slides, tutorial videos, audios, worksheets and exercise sheets, interactive tasks, learning software etc.),
- materials created to advise and inform educational stakeholders (information sheets, checklists, brochures, handouts, blog posts, podcasts, etc.),
- materials produced for training purposes (serious games, websites, online courses, VR and AR applications, templates, etc.),
- knowledge transfer materials produced to inform the general public,
- materials that can be prepared for empirical studies and further used in science transfer (instruments for formative assessment, evaluation instruments, etc.).

DIPF and its employees aim to ensure that self-produced or participatory materials in terms of open educational practices are prepared and published as OER in order to make them accessible and reusable for everyone.

Employees will ensure that

- materials are published with a license that is as open as possible (e.g. Creative Commons) in order to promote reuse.
- materials are clearly licensed and described with sufficient metadata (e.g. Learning Object Metadata Standard).
- materials are available in non-proprietary file formats wherever possible and can be opened or edited with open source software.
- materials are stored in a central or acknowledged repository and can be found and cited via a persistent identifier (e.g. DOI).

The institute ensures that

- OERinfo provides educational researchers (and others) with a central information and contact point for the use and provision of open materials in terms of OER.
- OERinfo is a permanent central advisory structure for dealing with materials from research, teaching and knowledge transfer so that all employees can receive individual advice on aspects of OER.
- employees are informed about all aspects of OER in suitable formats (e.g. on the intranet or in workshops) and receive further training in this regard.
- DIPF takes part in cross-disciplinary and subject-specific initiatives in the field of OER in terms of exchange and networking.

Open Research Software

Open Research Software concerns research output in terms of scientific software and its documentation. The software is publicly accessible and can be referenced via accessible repositories (e.g. Github, CRAN). The development of scientific software as a research output as well as a contribution to research support is thus more visible and significant. Open Research Software is published under an appropriate license (such as [General Public License 3](#)).

Research software is created at DIPF both in short-term research projects (such as externally funded projects) and in large-scale structures (e.g. the Center for Technology-based Assessment) and as part of ongoing activities (e.g. in the further development of operated infrastructures).

DIPF and its employees strive to publish research software in accordance with the established principles of Open Research Software, considering research processes and timelines. Furthermore, we use external Open Research Software whenever possible for our own research or for the development and expansion of infrastructures. This way, the re-usage of software is guaranteed and the creation of software is rewarded.

Employees ensure that

- developed software is published in a public repository as openly as possible and with open license formats (e.g. [General Public License 3](#)).
- the software is made available as soon as temporary projects are completed.
- in the case of developmental work, software respectively individual components are regulated in a transparent process.
- the developed software is made citable with metadata and a unique identifier if possible.
- open source code is used and cited wherever possible when using external software.

The Institute ensures that

- open source software can be used in research and infrastructure development.
- employees can preferably use open source software instead of proprietary or non-open source software.
- the Center for Technology-Based Assessment (TBA) provides a central information and service structure for educational research (and beyond) for the use and provision of open source software for the collection of research data.
- employees receive individual support and advice on the use and licensing of open source software.
- employees are informed about all aspects of open research software in suitable formats (e.g. on the intranet or in workshops) and receive further training in this regard.

Open Infrastructure

Open infrastructures enable open access to or the exchange of digital objects and are preferably based on open source software and open standards (interfaces, protocols, formats). Open infrastructures help scientists implement open science as a practice. [UNESCO](#) mentions, for example, platforms and repositories for publications and data, archives, scientometric systems for scientific research and systems for collaborative analysis.

By providing, operating and further developing open infrastructures, DIPF contributes to inclusive, sustainable and open educational research and enables open science practices. At DIPF, such open infrastructures are fundamental for specialist and supra-regional services for educational research. DIPF offers infrastructures for references, data and sources for educational research as well as for educational research monitoring, educational information and knowledge transfer.

Employees ensure

- that open infrastructures are preferred.
- the establishment and further development of infrastructures in participatory development.
- dealing with the subject-specific developments of Open Science and they incorporate the current subject-specific needs and requirements into the development and expansion of infrastructures.

The Institute ensures that

- the infrastructures are described with open metadata and specifically with the preferred citation, - if possible.
- the metadata of the resources provided within the infrastructures are as open as possible (FAIR principles).
- the development of existing and new infrastructures for the implementation of Open Science practices is promoted and operated in a sustainable and demand-oriented manner. Users are systematically involved in the development process.
- DIPF participates in the collaborative (further) development of existing and new infrastructures for national and international networking. In addition to the scientific communities, other user groups are addressed (Citizen Science, Wikimedia contexts).
- employees are individually supported and advised in the use and provision of Open Infrastructures.
- employees are informed about all aspects of Open Infrastructures in suitable formats (e.g. on the intranet or in workshops) and receive further training in this regard.

C. Strategic further development of Open Science

In the near future, DIPF seeks to further expand on its pioneering role in the application and infrastructural development of open science in educational research in order to establish the opening of science as part of good scientific practice and a culture of open science at the institute and in educational research. The joint implementation of the dimensions described in Part B will be further advanced. The strategic priorities described below will be actively addressed and promoted, i.e. expansion of infrastructures and support, promotion of best practices and capacity building, networking and cooperation, incentive systems and monitoring.

The strategic development invites an improved coordination of open science activities. DIPF focuses on sounding out the strategy, networking with other players in the open science community and organizing and coordinating further training measures in order to significantly advance the development of open science. In addition, cross-departmental structures for cooperation will be created, such as advisory structures for the dimensions listed above.

Expansion of infrastructure and support

DIPF hosts central specialist infrastructures to enable Open Science in German educational research. These will be further developed to support the implementation of the Open Science Codex. The dissemination of Open Access publications to the scientific communities and the general public will be further expanded through the peDOCS and FIS Bildung infrastructures and the transformation to an Open Science culture will be promoted using the subject portal for education. The metadata of scientific products (literature, research data, OER) will be made openly available for specialist open metrics analyses where possible and appropriate, and an open education knowledge graph will be developed. The Education Research Data Center (FDZ Bildung) and the Education Research Data Network (VerbundFDB) will establish and expand the provision and reuse of research data in educational research. The Research Library for the History of Education at DIPF (German: BBF | Bibliothek für Bildungsgeschichtliche Forschung) provides infrastructures and services for the application of open science in historical educational research. At the inter-departmental Center for Technology-Based Assessment (TBA), open source research software is created and further developed for all steps in the assessment cycle (creation of digital materials such as

interactive tasks, evaluation of data, implementation of data collection for scientific studies, transfer and documentation of instruments, etc.) in the field of educational research. This software is also disseminated to the relevant target groups.

Promotion of best practices and capacity building

In order to implement the Open Science Codex, support and further training opportunities for academic and academic support staff are being expanded. The Frankfurt Research Library, the VerbundFDB, the TBA Center, the Fachportal Pädagogik with peDOCS and the Fachinformationsdienst as well as OERinfo and the BBF Digital History of Education Lab offer workshops on open science practices, ranging from open access publishing to research data management and the creation of digital assessment content to OER. These training courses will also be integrated into the PhDIPF Academy, the program for early career researchers at DIPF. All activities will be embedded in an open science curriculum in order to make them more visible and disseminate them to the relevant target groups. The curriculum will systematize key content on open science so that it can be used for structured support of researchers in early career phases and as an orientation guide for all employees. It will have a modular structure and collect, tie together and provide resources for the various subject areas. Training sessions, hands-on workshops and information events on other open science practices will complement the curriculum. The services will be tailored to needs of internal and external interested parties, for example specifically for people outside the institute in historical educational research or university lecturers who want to teach their students about Open Science.

The Open Science Codex is supported by a dialog platform offering best practices. The best practices show concrete ways and steps how employees have implemented open science practices, as well as the various options for implementation, what open science can mean in the individual research context and what needs to be considered. The dialog platform with best practices also lists experienced employees and persons who can be contacted for support. It is accessible to all employees in an open forum (wiki) so that the best practices can be supplemented and commented on. The wiki is maintained by members of the Open Science and Practice working group (German: AK Offene Wissenschaft und Praxis).

Networking and cooperation

Open Science practices can best be promoted and implemented by joining forces. DIPF will continue to be involved in national and European initiatives and committees in order to expand open infrastructures, internationalize open science practices and support research on open science practices.

These include: NFDI consortia (text+, 4Memory, KonsortSWD), the Leibniz Research Network Leibniz Data, the Leibniz Strategy Forum Open Science, the FIS Bildung cooperation network, specialist information services and the EERA Network 12: Open Research in Education.

DIPF staff ´have also joined working groups and collaborations that promote the expansion of Open Science infrastructures and foster Open Science practices.

Incentive systems and research evaluation

DIPF recognizes and supports the activities of employees who contribute to living Open Science as a scientific culture and who promote corresponding practices and enable them through the establishment and expansion of internal and supra-regional infrastructures. At the same time, there is an awareness that Open Science practices can only be implemented as a standard if they are explicitly recognized and appreciated in the scientific community. Bearing this in mind, DIPF aims at creating and promoting incentive structures that appropriately recognize open science practices and infrastructures.

DIPF will intensify efforts to recognize Open Science practices and infrastructures over the coming years and, in this context, will investigate how they can be better integrated into the evaluation process. For instance, this includes:

- the recognition and highlighting of achievements in research data management,

- the recognition of open access (data) publications, the publication of open research software and open metadata,
- recognition of the operation and further development of open supra-regional infrastructures in accordance with the research community needs,
- the recognition of Open Science practices in selection/appointment committees (based on CoARA),
- recognition of networking, promotion and capacity-building for Open Science at the Institute and in educational research.

We aim to enter open science practices and infrastructures into the indicator system for evaluating the institute and for reporting to the Leibniz Association.

Monitoring

DIPF will continuously monitor and document the implementation of Open Science practices and the progress made in strategic development. This includes monitoring the implementation of the various Open Science dimensions (Part B) and strategic development, including capacity building (Part C). Collected key figures are to be jointly coordinated and expanded in the future. With regard to these indicators, their usefulness for measuring open science practices will be examined and, if necessary, specifically adapted to the framework conditions.

Monitoring is meant to serve the transparency of scientific practices. The knowledge gained will also be used to adapt the Open Science Codex iteratively and dynamically.