An Ethical Scoring System for the Production and Assessment of Alternatives in Education and Training

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Summary

Assessment of non-animal alternative tools in education and training is a process that must address a range of pedagogical, ethical, environmental and economic issues. Within the ethical field, criteria include whether and how animals were used in the production process, broader ethical issues presented by content and design, and potential for replacement of harmful animal use. To encourage humane production of alternatives and to facilitate assessment and implementation, InterNICHE has developed an Ethical Scoring System that forms part of a comprehensive review and assessment process. The potential for international implementation and associated widespread replacement is scored through judging an alternative's ability to meet and exceed the teaching objectives of a conventional practical class, and its accessibility, opportunities for translation and other criteria. The pedagogical and training aims of an alternative, with both explicit lessons and implicit messages, also play a role in the scoring, with alternatives developed for acquisition of knowledge and skills for the purpose of animal care scoring higher than those for the purpose of animal experimentation. When an alternative reflects progressive teaching approaches and technological innovation, and when holistic representations of animals rather than those portraying instrumental use are made, it also scores higher. In the production of video and software alternatives for anatomy classes, the use of animal cadavers that are ethically sourced according to the InterNICHE Policy on Alternatives and Animal Use in Education and Training rather than the use of purpose-killed animals would give products a higher score. In the production of physiology and pharmacology software, the use of existing data or mathematical algorithms rather than the use of data derived from new animal experiments would also give products a higher score. Examples of the process of ethical scoring for alternatives will be presented, with an exploration of the criteria and their weighting.

The process is being applied to alternatives included in the InterNICHE Alternatives Loan Systems and to selected items in the Alternatives Database, available at http://www.interniche.org. This will strengthen the process of review and assessment and further support curricular transformation. The results will also be discussed with producers to help improve the nature and quality of products.

Keywords: Ethical Scoring System, assessment, alternatives, animal experiments, education

1 Introduction

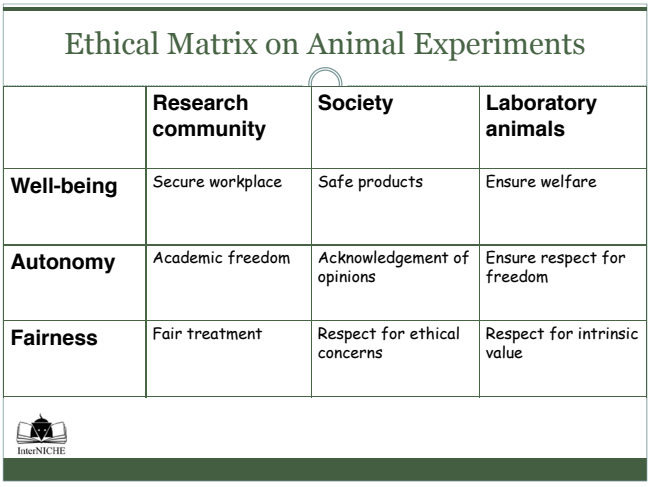
The development and implementation of non-animal alternative tools in education and training are often the result of an evaluation process where the replacement of harmful animal use with humane, innovative methods reflects a range of pedagogical, ethical, environmental and economic considerations.

InterNICHE helps realise its vision of a fully humane education by developing, promoting and implementing alternative tools and approaches. Evaluation, including that of ethical quality, plays a crucial role in these processes, but may not always be done formally or consistently. In order to develop a more comprehensive, transparent approach to assessment, InterNICHE has developed the *Ethical Scoring System for the Production and Assessment of Alternatives in Education and Training*. This paper describes the InterNICHE Ethical Scoring System, which will be progressed, implemented and evaluated over time.

2 Ethical Matrix as a conceptual tool

In developing its Ethical Scoring System, InterNICHE has made use of the considerations behind the "Ethical Matrix", as developed by Prof. Ben Mepham at the Centre for Applied Bioethics, University of Nottingham, UK (Mepham et al., 1996). An Ethical Matrix is a conceptual tool designed to help reach decisions about the ethical acceptability of technologies, practices and other issues. It has been used by ethical consultancy bodies, governmental reference groups and others in a range of processes, particularly in debates about the issue of transgenic animals used in food production (Kaiser, 2005; Kaiser et al., 2007).

The Ethical Matrix has potential for use within a wide variety of issues, and animal experimentation is an area that is often considered suitable. The basic structure and process is to apply a number of important principles to a set of selected interest groups. The standard principles comprise *respect for*



Ethical Matrix on Animal Experiments

	Research community	Society	Laboratory animals
Well-being	Secure workplace	Safe products	Ensure welfare
Autonomy	Academic freedom	Acknowledgement of opinions	Ensure respect for freedom
Fairness	Fair treatment	Respect for ethical concerns	Respect for intrinsic value

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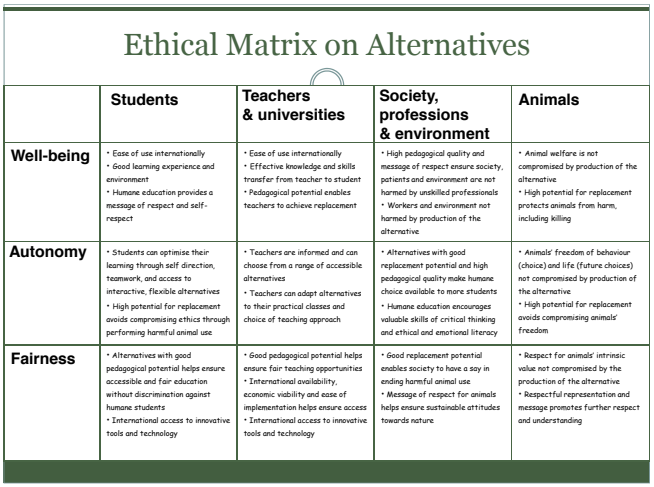
Fig. 1: Example of an Ethical Matrix, as applied to animal experiments in research and testing



Ethical Matrix on Alternatives

	Students	Teachers & universities	Society, professions & environment	Animals
Well-being	• Ease of use internationally • Good learning experience and environment • Humane education provides a message of respect and self-respect	• Ease of use internationally • Effective knowledge and skills transfer from teacher to student • Pedagogical potential enables teachers to achieve replacement	• High pedagogical quality and message of respect ensure society, patients and environment are not harmed by unskilled professionals • Workers and environment not harmed by production of the alternative	• Animal welfare is not compromised by production of the alternative • High potential for replacement protects animals from harm, including killing
Autonomy	• Students can optimise their learning through self direction, teamwork, and access to interactive, flexible alternatives • High potential for replacement avoids compromising ethics through performing harmful animal use	• Teachers are informed and can choose from a range of accessible alternatives • Teachers can adapt alternatives to their practical classes and choice of teaching approach	• Alternatives with good replacement potential and high pedagogical quality make humane choice available to more students • Humane education encourages valuable skills of critical thinking and ethical and emotional literacy	• Animals' freedom of behaviour (choice) and life (future choices) not compromised by production of the alternative • High potential for replacement avoids compromising animals' freedom
Fairness	• Alternatives with good pedagogical potential helps ensure accessible and fair education without discrimination against humane students • International access to innovative tools and technology	• Good pedagogical potential helps ensure fair teaching opportunities • International availability, economic viability and ease of implementation helps ensure access • International access to innovative tools and technology	• Good replacement potential enables society to have a say in ending harmful animal use • Message of respect for animals helps ensure sustainable attitudes towards nature	• Respect for animals' intrinsic value not compromised by the production of the alternative • Respectful representation and message promotes further respect and understanding

Fig. 2: Ethical Matrix on alternatives in education and training

well-being, autonomy, and *fairness*. These form the columns in the matrix, and the interest groups form the rows (Mepham, 2006). (In this paper, the axes have been exchanged for clarity of presentation.)

For dilemmas concerning animal experimentation, the interest groups are typically represented as the research community, society, the experimental animals, and the environment (Kaiser, 2004). The different groups and the presentation of principles may differ according to the ethical question at hand. The evaluation process consists of assigning perceived important interests or best outcomes (and sometimes values), to each interest group in relation to the principles. A numerical value or score – negative, positive or neutral – can be given to each as a basis for further discussion. Importantly, the individual scores are not added together. An example of an Ethical Matrix addressing animal experiments within research and testing is provided in Figure 1.

The purpose of the Ethical Matrix is not necessarily to offer a model which will enable the drawing of a simple conclusion, but instead to provide structure and transparency. Debate can then be more effective, resolution encouraged, and decisions explained or criticised. However, the Ethical Matrix must be used with care, as the interests in the different cells can differ in importance even if they have the same score (Mepham et al., 2006; Kaiser and Forsberg, 2001).

In some instances the use of the Ethical Matrix reflects shortcomings in defining interest groups. The latter may be unequally weighted: some may share interests and so together appear to have a greater stake; another interest group that is negatively affected by the ethical dilemma may appear to be in a minority. However, it should be noted that the interest groups are not necessarily in opposition: indeed, the best solution to the ethical dilemma would be that which gives a positive outcome for all the interest groups. Concerning alternatives in education and training, this can certainly be possible.

3 Ethical Matrix for alternatives in education and training

The Ethical Matrix was used to define the principles and interest groups for the InterNICHE Ethical Scoring System, and to help identify the qualities of a non-animal alternative that would help it score highly. Using the standard principles of respect for well-being, autonomy and fairness, four interest groups were defined: the students; the teachers and universities; society, the professions and the environment; and the animals.

Producers of alternatives are not included as a specific interest group. The aim of the Ethical Scoring System is not to evaluate the potential of the alternative as a successful product to sell, but as a successful product to use with the specific aims of enhancing education and training, replacing animal experiments, and achieving other objectives. Producers are nevertheless considered within the interest group "society, the professions and the environment", where fair conditions for production are important.

An Ethical Matrix for alternatives in education and training, with a range of interests identified, is presented in Figure 2.

4 Identifying criteria for the Ethical Scoring System

The scoring of interests identified within an Ethical Matrix is usually done within the matrix itself. For the case of the Ethical Scoring System for alternatives, InterNICHE has extracted a set of 7 key criteria from the interests, to be used as a basis for the detailed evaluation of alternatives. The choice to group the interests and use these criteria reflects the commonality of experience and intersection of interests between different interest groups – in particular, the multiple negative impact of harmful animal use and the multiple positive impact of alternatives.

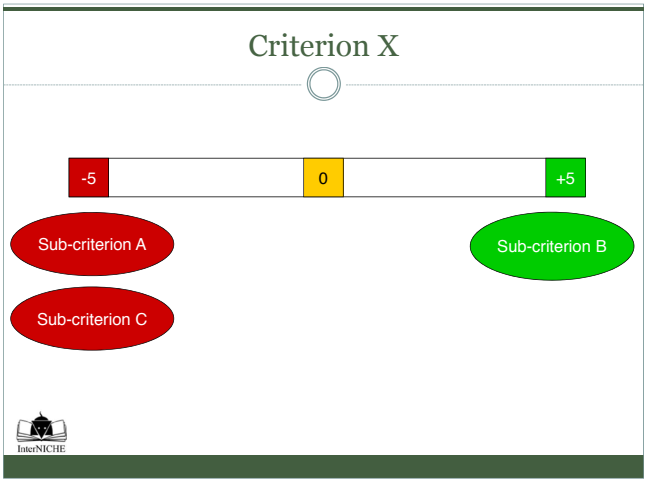


Fig. 3: Scoring of sub-criteria

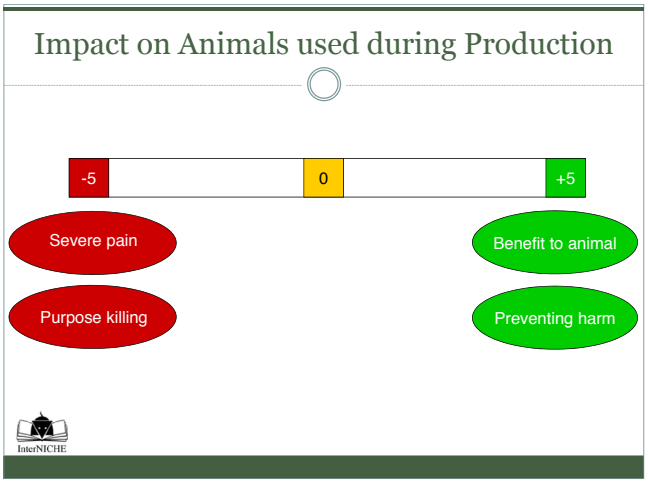


Fig. 4: Impact on animals used during production of the alternative

The 7 key criteria for alternatives in education and training are:
1. Impact on animals used in the production process
2. Social and environmental responsibility in the production process
3. Meeting teaching objectives
4. Impact from messages within content and design
5. Potential for replacement
6. Ease of implementation
7. Global dissemination and access

5 Evaluating alternatives by scoring sub-criteria

For each alternative that is to be evaluated, the different qualities, practices and experiences associated with it – the sub-criteria – are then scored. An example of a *quality* is high potential for replacement; of a *practice* is the killing of an animal in the production process; and of an *experience* is user-friendliness.

The scores of the sub-criteria are the variables that are measured, for consistency and clarity, on an interval scale from -5 to +5. The negative scores reflect sub-criteria with negative impact on the interest groups, and the positive scores reflect those with positive impact. Increasing negativity or positivity is measured in increments of 1. A score of 0 indicates neutrality or non-relevance. Guidance on the allocation of scores, and the justification for these choices, is part of the on-going development process and will be described fully in a future publication.

1. Impact on animals used during production of the alternative
This criterion addresses the issue of harm being inflicted on animals during the production of the alternative that is being evaluated. Examples of such use include the performance of animal experiments for making a physiology software alternative, or killing an animal to obtain its cadaver for plastination within anatomy. Such use is a serious ethical issue, and the scoring process must be well defined.

A score of -5 is given for the purpose-killing of an animal, or severe pain and distress caused. Scores of -4 to -1 are given for different levels of pain, distress and captivity. Positive scores from +1 to +5 are given when the animals used in the production process benefit from the intervention; for example, an animal being rescued or receiving necessary treatment as part of making a clinical skills and surgery software alternative. Positive scores are also given where producers prevent harm to animals; the Ethical Scoring System rewards the use of algorithms or existing data rather than new experiments on animals, and the use of ethically sourced animal cadavers (Martinsen and Jukes, 2008a), rather than those derived from purpose-killed animals.

The specific score chosen to reflect such use derives from a deeper level of analysis performed to measure the alternative's degree of conformity to the InterNICHE Policy on the Use of Animals and Alternatives in Education and Training (Martinsen and Jukes, 2008b). The Policy defines "ethically sourced animal cadavers", for example, and accepts this description for a cadaver when a number of conditions have been met. These include, but are not limited to, the following: that the animal was free living before death; that it died naturally, in an accident, or was euthanised for medical reasons; and if a companion animal, that consent for donation and use was provided by the guardian. Different conditions are weighted differently.

2. Social and environmental responsibility in the production process
The production of any alternative has a social and environmental impact, which is assessed under this criterion. Negative impacts with resultant negative scoring include the exploitation of workers, health and safety violations, pollution and waste of resources. Positive scores indicate not only an absence or

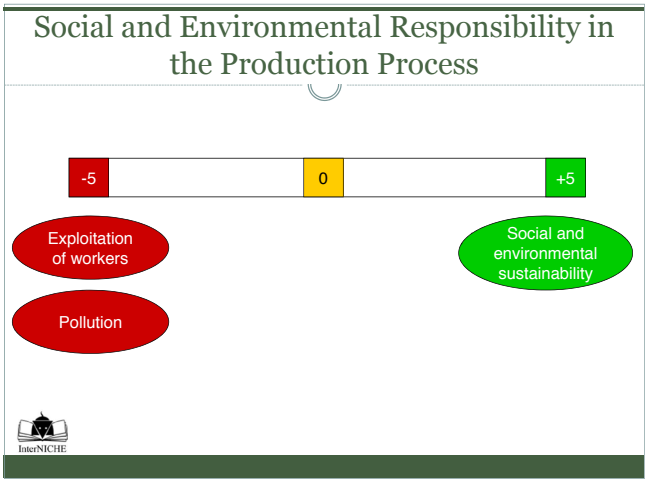


Fig. 5: Social and environmental responsibility in the production process

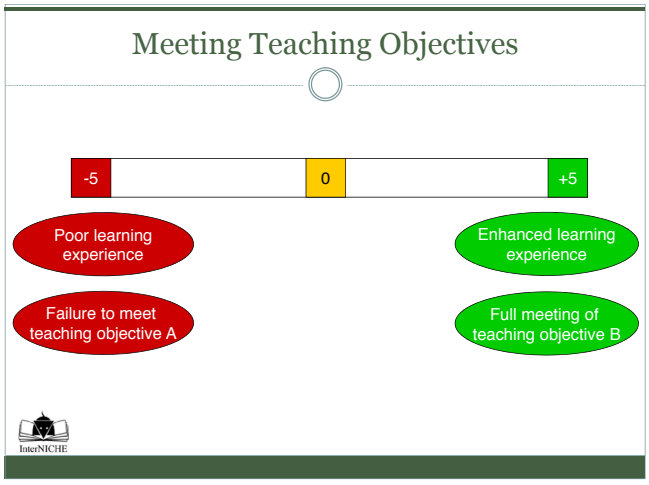


Fig. 6: Meeting teaching objectives by using the alternative

neutralising of negative impact, but an active contribution to improving society and the environment.

3. Meeting teaching objectives

The meeting of curricular teaching objectives – that is, the effective acquisition of knowledge, skills and attitudes that are defined by teachers – is an essential component of the Ethical Scoring System. Many courses have been audited to ensure that the teaching objectives associated with them are clearly identified and that the tools to meet them are being employed successfully. The scoring of each alternative will be performed for a wide range of teaching objectives. It should be noted that the scoring within this criterion does not refer to how well the alternative simulates an animal experiment, nor does it reflect its quality as a learning tool relative to the animal experiment it may replace.

4. Impact from messages within the content and design

Curricular teaching objectives are not the only lessons learned in an educational setting. Further learning takes place outside of what has been defined by teachers. Such lessons involve the explicit and implicit messages transmitted through the content and design of learning tools and within the educational context. Attitudes, values and beliefs may be developed in this way, and they may be positive or negative. As these messages do not form part of the acknowledged teaching objectives, and may be consciously or unconsciously transmitted, they may be harder to identify and measure.

The following examples form part of the range of sub-criteria that will be identified and assessed for each alternative under this criterion: Negative scores are given to negative representations of animals, such as describing animals as instruments or tools; alternatives that train the student or trainee in procedures with the future aim of performing animal experiments in research and testing, rather than helping animals in a clinical

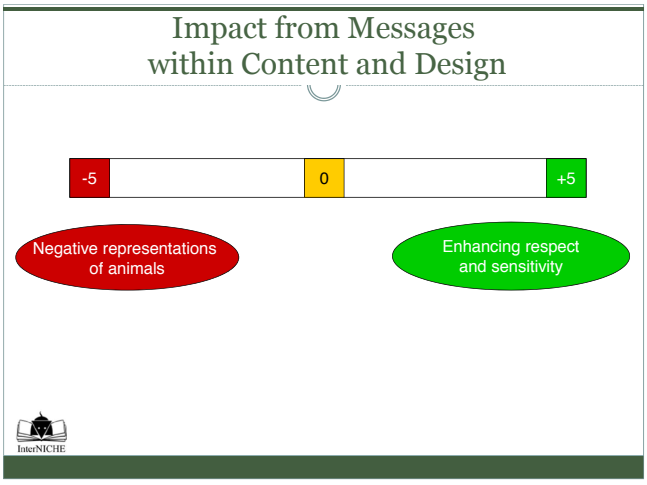


Fig. 7: Impact from messages within the content and design of the alternative

setting, would receive a negative score; positive scores will be given if the message demonstrates respect and sensitivity towards animals.

5. Degree of potential replacement

The potential for replacement of animal experiments and of dissection of purpose-killed animals is a very important criterion in the evaluation of an alternative. For this criterion, the negative side of the scoring is not used, as an alternative is by definition meant to replace such use (Jukes and Martinsen, 2008). Scores from 0 to +5 illustrate how well the alternative is able to replace harmful animal use. This takes into account both the number of animals used, and the severity of the use.

The evaluation of an alternative for its potential for replacement should also take into account its role in the broader picture of curricular design. While many alternatives can directly re-

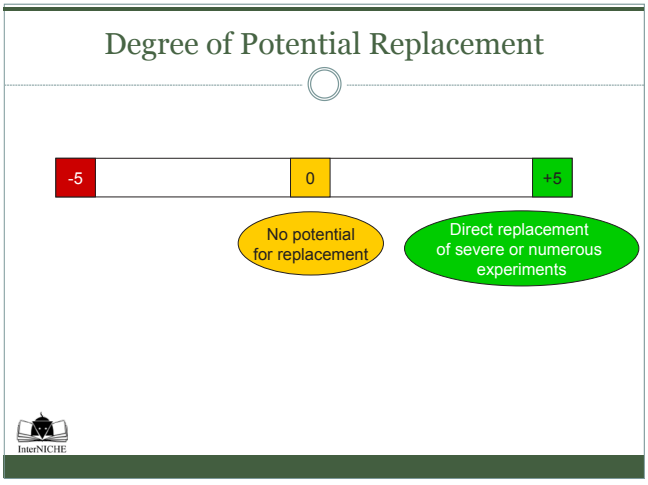


Fig. 8: Degree of potential replacement by the alternative

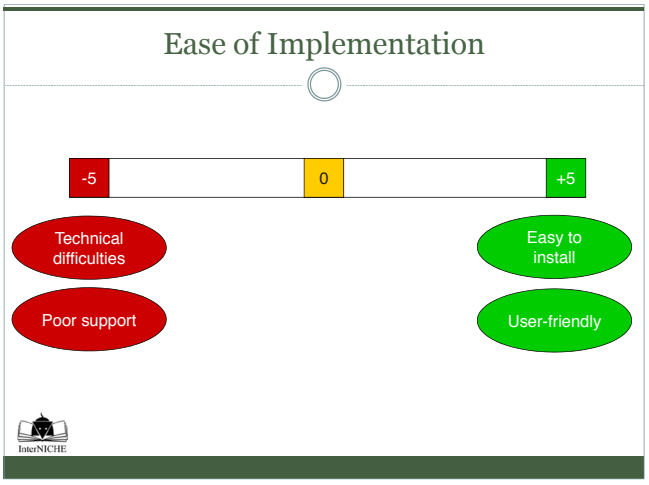


Fig. 9: Ease of implementation of the alternative

place all the harmful animal use in a specific practical class, others might replace one element only, and require another learning tool to be used in conjunction with it in order to achieve full replacement. Indeed, combining tools and approaches in order to meet teaching objectives is standard practice.

Conflicts between criteria may sometimes be found. A software alternative that simulates an animal experiment may have high potential for widespread replacement, yet may still transmit a message of ethical "acceptability" or pedagogical "value" of the instrumental animal use. Despite the potential replacement, the animal experiment is in fact to some degree validated by its simulation, particularly if the former is not critiqued to sufficient depth. The process of separate scoring of qualities, practices and experiences for an alternative across each of the criteria can make apparent such conflicts and encourage further discussion.

6. Ease of implementation

This criterion measures the degree to which the alternative is easily implemented by the teacher and used by the student. Different factors hinder or facilitate the process, and together they help define whether and how successfully the alternative is used. These factors are the sub-criteria to be assessed, and include ease of installation and technical compatibility, user-friendliness, tailorability, availability of wrap-around support material, availability of replacement parts, and customer support. Negative scores reflect alternatives that may be difficult to implement; and positive scores reflect those for which the factors help in implementation. It should be noted that what is a positive factor in one country might be negative in another.

7. Global dissemination and access

The degree to which alternatives can be globally disseminated and accessed is an important criterion to assess. The InterNICHE vision is of humane education and training practiced

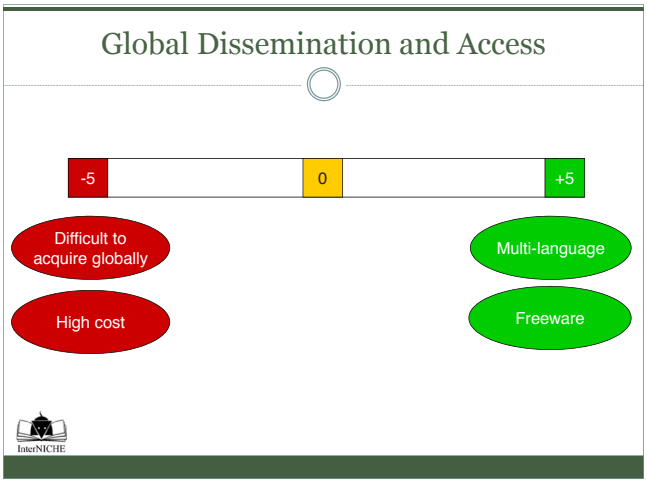


Fig. 10: Potential for global dissemination of and access to the alternative

right around the world, so factors such as international availability and ease of acquisition, cost, multi-language options and ease of translation, and cultural inclusivity in terms of content, would score highly. Similar to the assessment of factors addressed under ease of implementation, negative scores for these sub-criteria reflect alternatives that hinder global dissemination, and positive scores reflect those that help. Again, different factors have different degrees of relevance for different users.

6 Implementing the Ethical Scoring System

InterNICHE has established a working group to progress the Ethical Scoring System with objectives that include research and development, scoring alternatives, sharing results and follow-on activity. The first task is to identify, for each of the 7 cri-

teria, the many qualities, practices and experiences associated with the diversity of alternatives; it is these sub-criteria that will be given scores in the evaluation process.

The research will draw on the extensive experience of InterNICHE as a campaigning organisation and network, and combine it with new research. This includes researching data and experience on curricular and broader teaching objectives. Sources such as the Studies Database on the InterNICHE website http://www.interniche.org (Jukes and Danko, 2011) will be used. The second task is to develop guidance on the allocation of scores, and any weighting, for the qualities, practices and experiences already identified.

Once the framework is fully established, priority will be given to the application of scoring to alternatives held in the InterNICHE Alternatives Loan Systems. These libraries of learning tools, used for loans, exhibitions and training, feature exemplary alternatives for which more detailed assessment will be valuable. The assessment of selected products listed in the InterNICHE Alternatives Database on the InterNICHE website will follow. For these processes, research specific to each product will be needed. This will require contacting producers. Some data might not be readily or practically available.

The results will be made available for all interested parties via the InterNICHE website, and integrated into the forthcoming reviews and assessment functionality of the Alternatives Database and pages of the Alternatives Loan Systems. A number of alternatives will be used to showcase and illustrate the multi-layered process of the Ethical Scoring System. Reviews, evaluation and improvements will be made to the system over time in order to maximise its value and impact and to share experience.

7 Conclusion

The InterNICHE Ethical Scoring System is an evolving project that offers a comprehensive and considered approach to the assessment of alternatives and to the rarely considered ethics of production. It can provide insight into the processes of knowledge and skills acquisition, and encourage the development of a broader and more realistic picture of what is taught and not taught. The system can be used to better advise teachers, students and others on humane education and on potential replacements for harmful animal use. By linking it in to the InterNICHE database resources it can facilitate the making of informed choices about alternatives and, through negotiations with producers, it can help enhance the ethical and pedagogical quality of products.

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