



Pädagogische
Hochschule Weingarten



Bilingual Teaching in Biology: Impressions from the Viewpoint of Biology Didactics

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Michael Ewig

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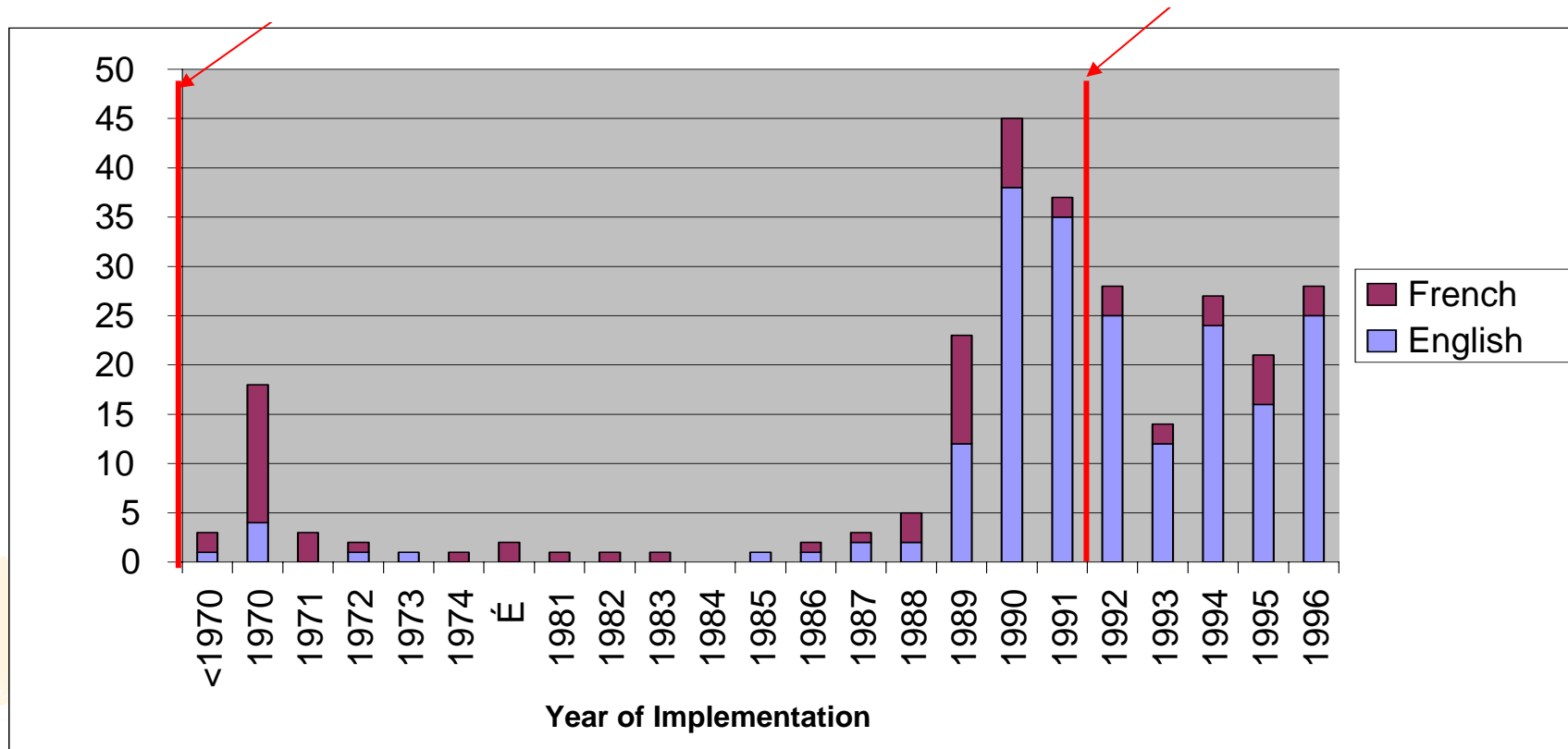
Overview

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- Look back at the „History“ of Bilingual Teaching
- Bilingual Teaching at school - an example
- Some research questions - and first findings
- Looking ahead...

Implementation of bilingual teaching at German schools (Thürmann, 1997)

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Motivation: „Culture“ ...

„Economy“ ...

... and today: „Science“ - with English as *lingua franca*

Structure of bilingual branch at a secondary school in NRW

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Model of *Sekundarstufe I* at a school in research project

Grade	lessons / week English	lessons / week Bilingual Branch		
		Biology	Geography	Politics
5	7 (5)	0	0	0
6	7 (5)	0	0	0
7	4	3 (2)	0	0
8	4	2	3 (2)	0
9	3	2	2	0
10	3	0	0	2

Some research questions - and first findings (from the viewpoint of Biology Didactics ...)

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- A) Who „needs“ students
being taught bilingually in Biology?
- B) How about teaching material
for bilingual education in Biology?
- C) Naming, knowing and protecting species
- open questions for learning on „biodiversity“ ...

A - Who „needs“ ... ?

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■ Question:

Is there some interest in students
being taught bilingually in Biology?

■ Research approach:

Questionnaire on languages
used at a faculty of Biology at a German university

- 1.) Hauptsprache: Deutsch - Signatur in der Tabelle: „1“
 2.) zweithäufigste Sprache: Englisch - Signatur in der Tabelle: „2“
 3.) evtl. weitere Sprache: --- - Signatur in der Tabelle: „3“

Tragen Sie nun bitte unter Verwendung der Signaturen in die Tabelle ein, welche Sprachen von welchen Personengruppen in welchen Zusammenhängen tatsächlich genutzt werden

Zusammenhang		Gruppe	Prof.	WMA	Sekret.	TA	WHK	SHK	Stud.
Vorlesungen			1						
Übungen			1/2	1/2			1/2	1/2	1/2
Seminare			1/2	1/2			1/2	1/2	1/2
informelle Gespräche			1/2	1/2		1/2	1/2	1/2	1/2
Laborbesprechungen			1/2	1/2		1/2	1/2	1/2	1/2
Literatur-Recherche & -Analyse			2/1	2/1	1	2/1	2/1	2/1	2/1
Publikationen	national		1	1					
	international		2	2					
(Tele-) Kommunikation i.w.S.	national	schriftl.	1	1	1	1	1		
		mündlich	1	1	1	1	1		
	inter-national	schriftl.	2	2	2	2	2	2	2
		mündlich	2	2		2	2	2	2
Tagungen	national	Vortrag	2/1	2/1			2/1		
		Poster	2	2			2		
	inter-national	Vortrag	2	2			2		
		Poster	2	2			2		
Software			2/1	2/1	2/1	2/1	2/1	2/1	2/1
Seminare, Besprechungen mit ausländischen Gästen			2	2		2	2	2	

A - „Who needs...“ - Results

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(cf. Ewig, 2005, ZFF 16(2), 261-274)

- **Scientific language** at a German faculty of Biology is **English**
- **Non-scientific staff** should be able to communicate in English or „bilingually“ up to **40%** - depending on context
- **Students** should be able to communicate in English or „bilingually“ up to **40%** - depending on context
- **Lecturers** are willing to communicate up to **50%** in English or „bilingually“ in their lectures and seminars
- Results are supposed to be similar at other faculties of Biology in Germany/Europe
- 50% of lecturers at a faculty of Biology are supposed to be interested in students that have been taught bilingually (De/En) in Biology - in all grades („Sek I & II“)

B - Teaching Materials...

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- Bilingual Biology classes are taught only at about 100 schools throughout the country.
- This market is too small for publishing companies as to provide suitable textbooks - so textbooks are imported from abroad
- Questions:
 - Which materials are being used in bilingual Biology classes, which are required?
 - Do foreign textbooks match the German curriculum to be applied? Do they lead to the same academic objectives as in German Biology classes?

1st strand of investigation (Sabine Kozianka, 2005): Materials used and needed

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■ Question:

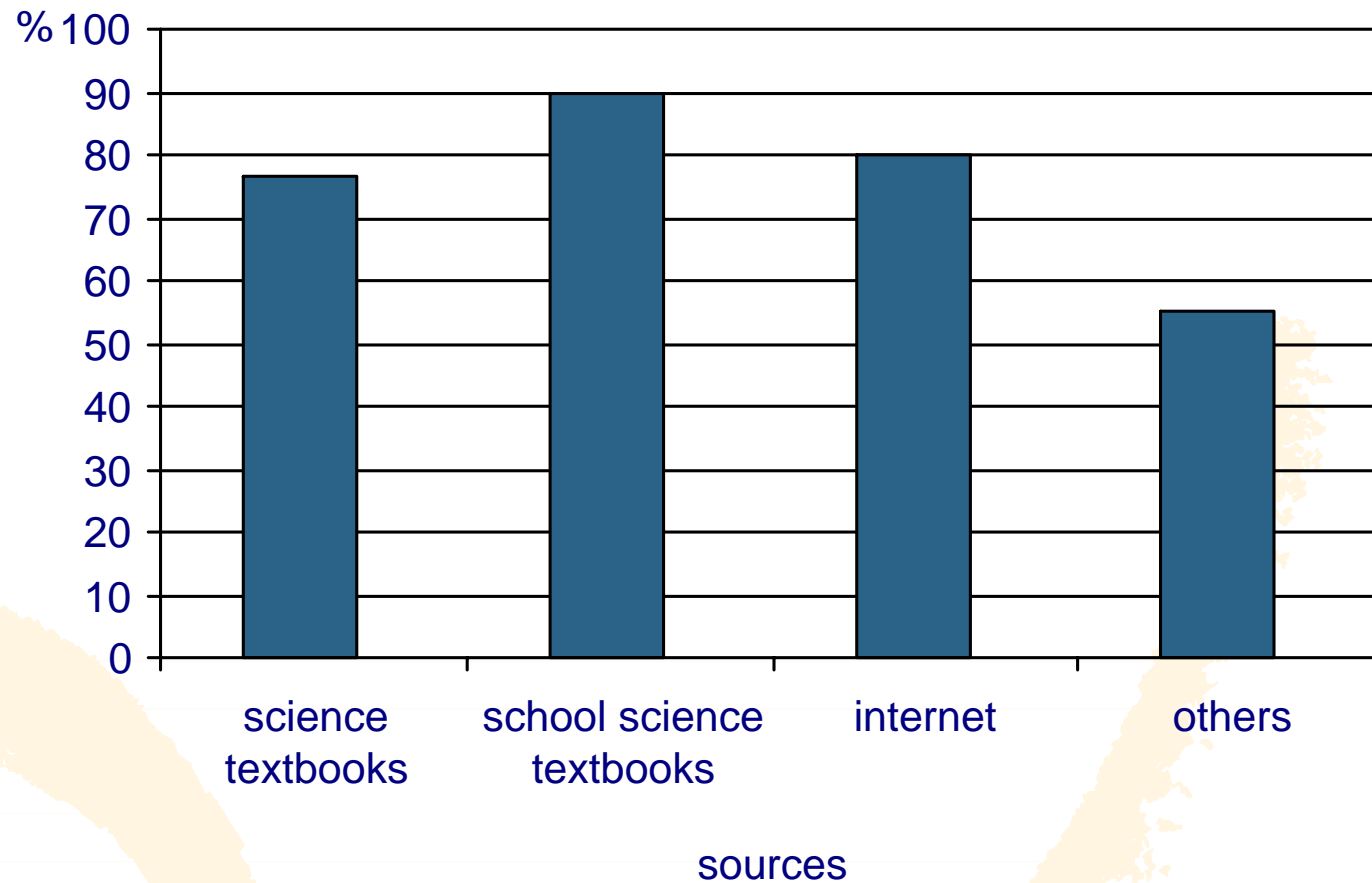
Which materials are being used
in bilingual Biology classes,
which are required?

■ Hypothesis:

Most materials being used in bilingual Biology classes
are imported or created by teachers themselves –
relief of teachers is desirable.

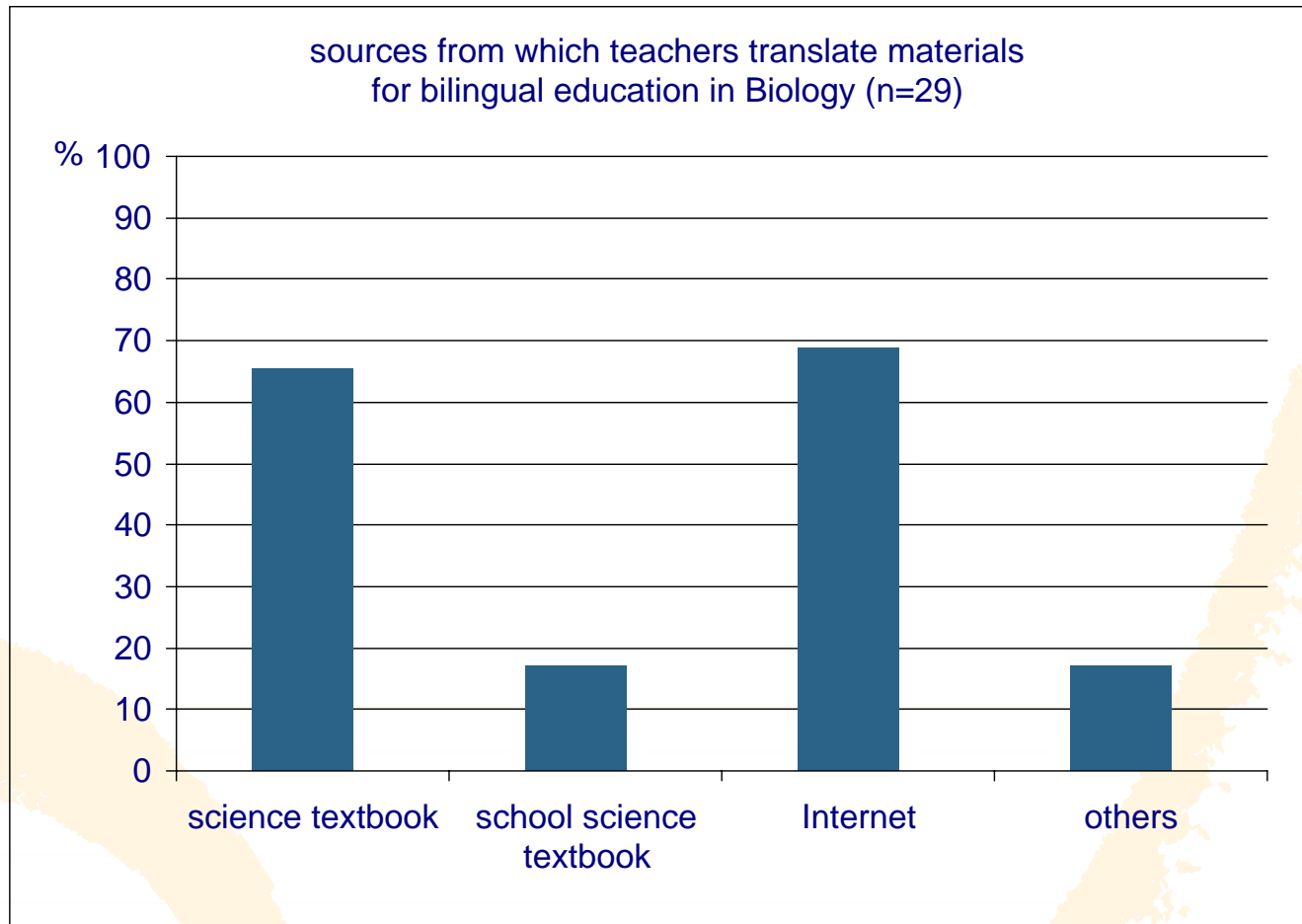
Sources for ready-for-use materials (n=60)

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Translation of materials

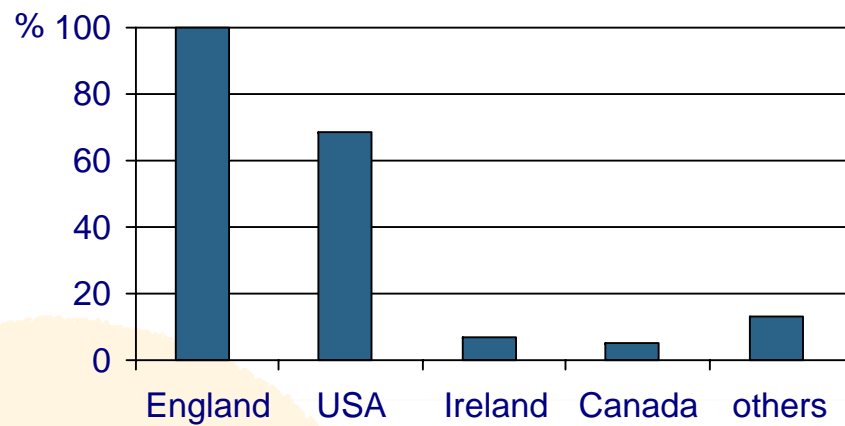
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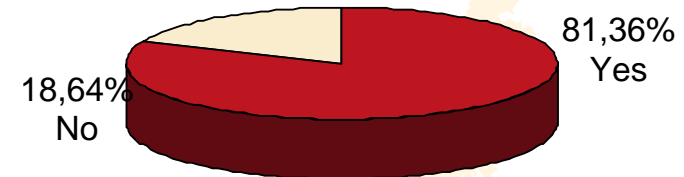
Use of school science textbooks

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Countries of origin of textbooks that teachers use in bilingual Biology classes (n=60)



Teachers use *one specific* textbook from country of target language



Examples of adopted textbooks

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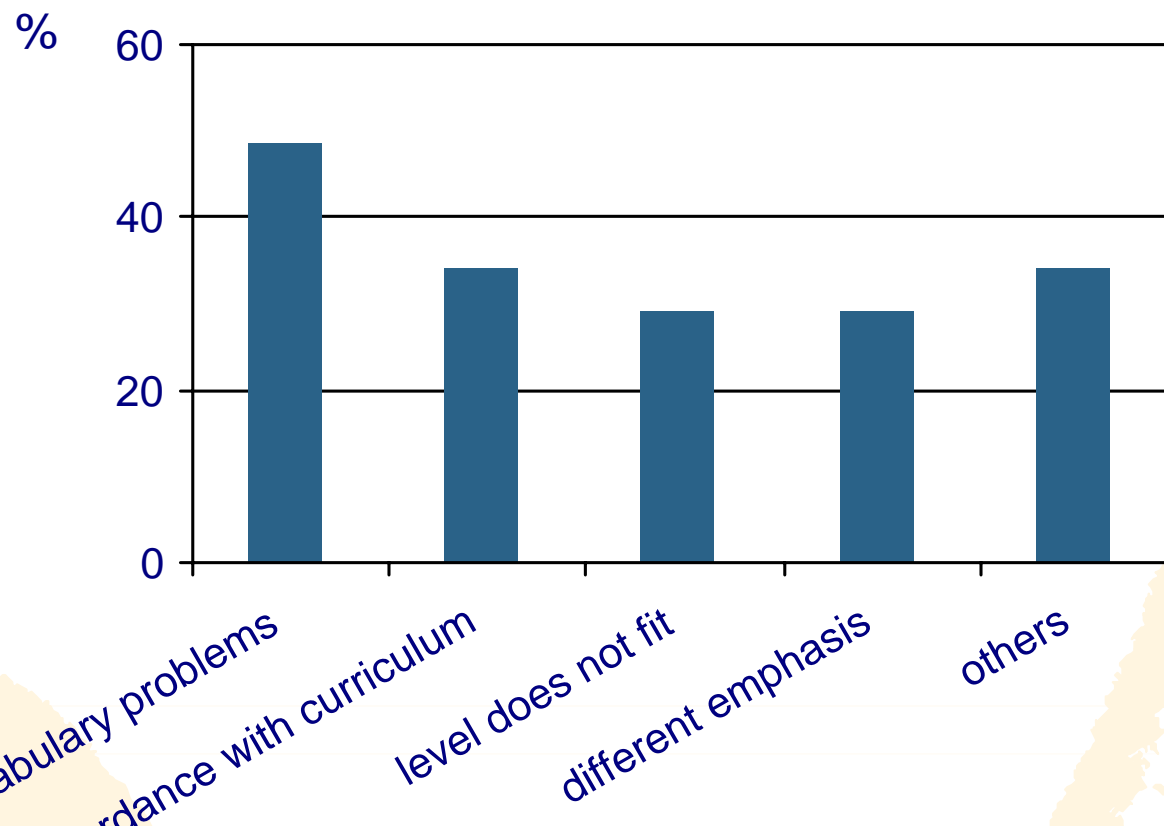
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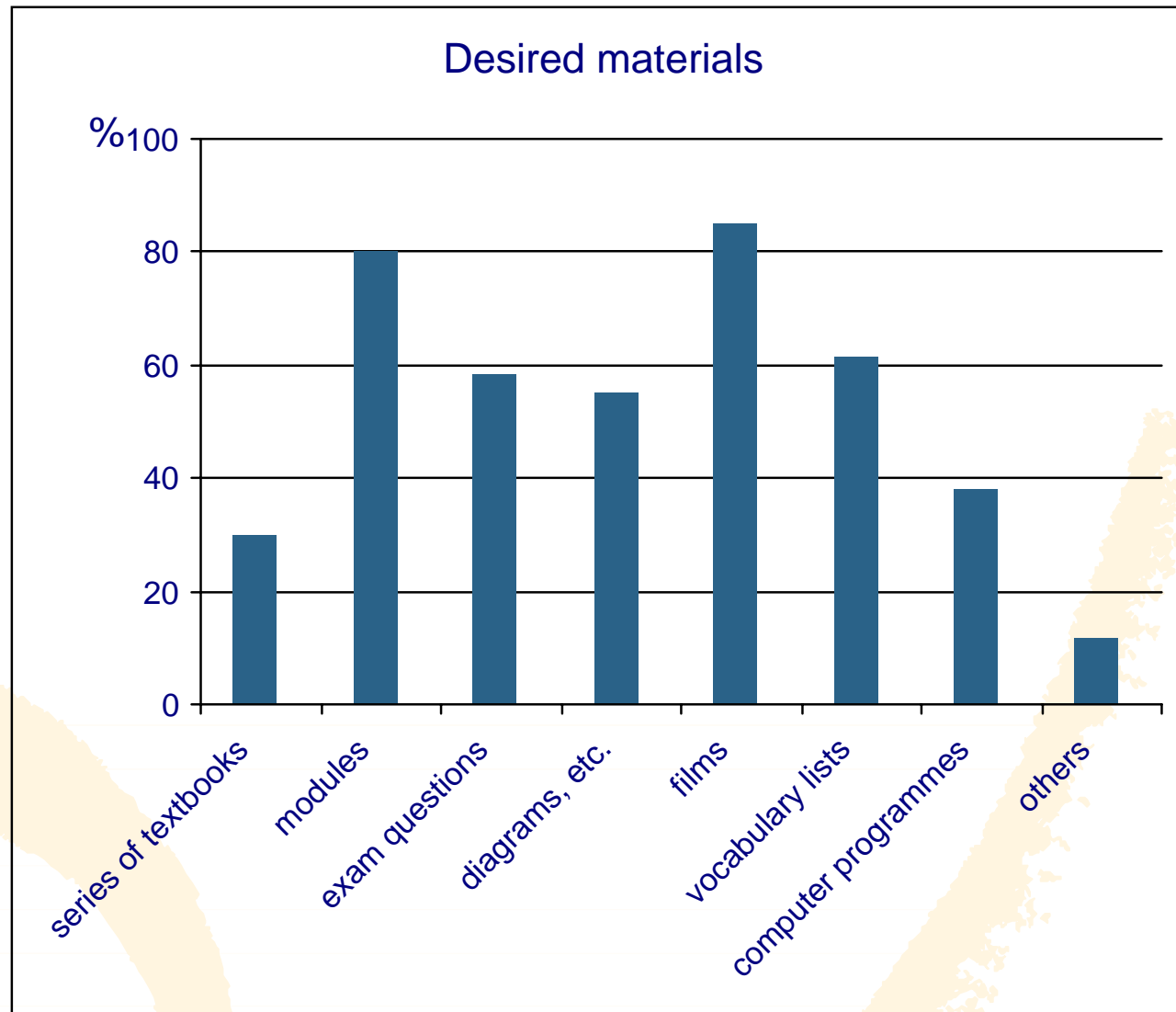
Problems when adopting materials (n=41)

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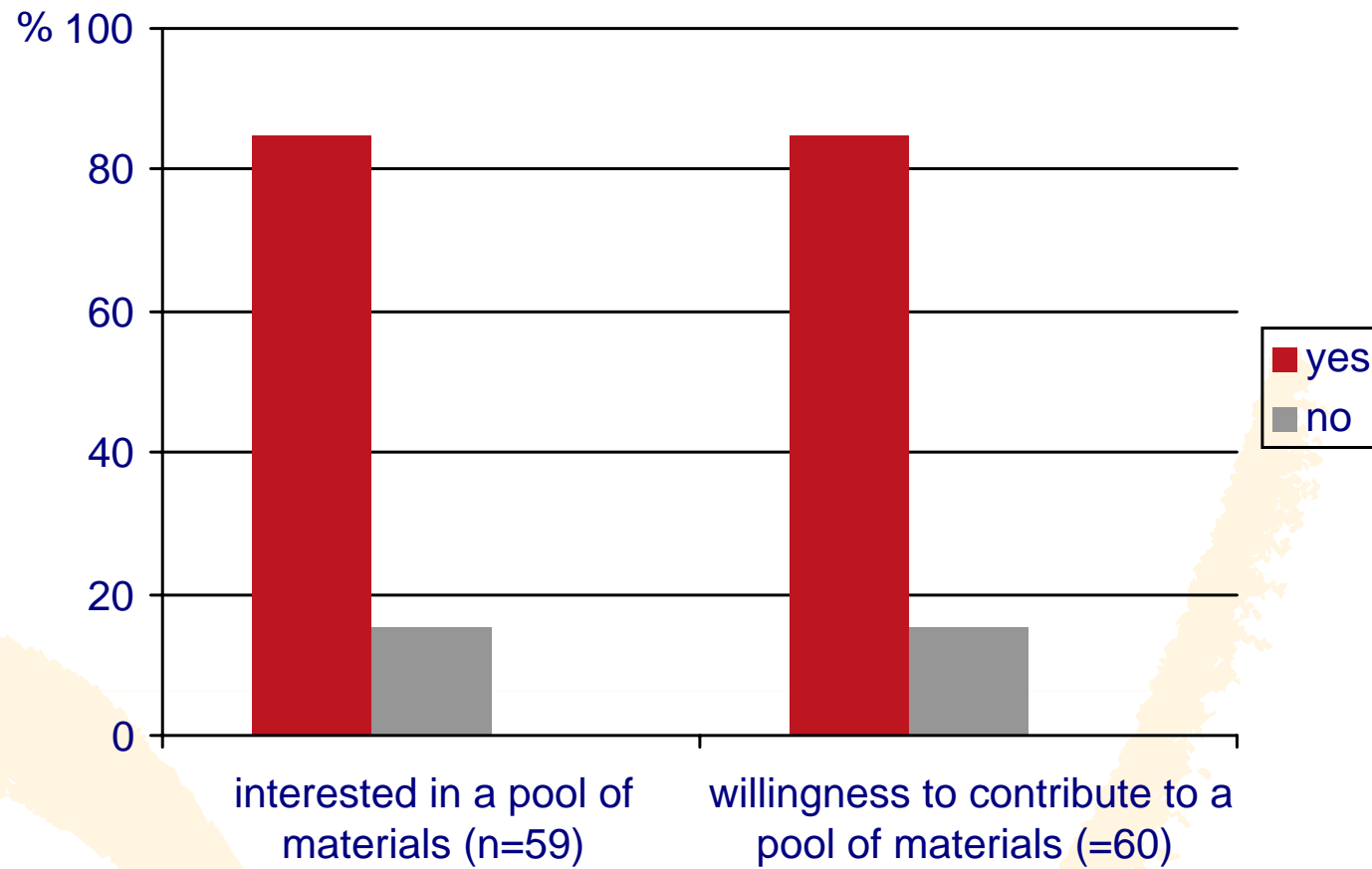
Desired materials

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Pool of materials

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Conclusion (1st strand)

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(Kozianka & Ewig, in press)

■ Caveamus:

There are no reference data of Biology teachers teaching in German for all data mentioned.

■ Nevertheless:

- Teachers of bilingual Biology classes use science textbooks and the internet as a source for creating their own teaching materials.
- Teachers import textbooks from target language countries .
- Teachers exchange materials and are interested in accessing a pool of materials and contributing to such a pool.
- Most of all, teachers would like to have stand-alone materials for single topics, films and vocabulary lists for bilingual Biology classes.

- This points at areas of interest for both foreign language didactics and didactics in the subject matter (here: Biology didactics).

2nd strand of investigation (Sarah Uckelmann, 2006): comparison of school science textbooks (Biology / Ecology)

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Hypotheses:

- English textbooks are not suitable for the use in bilingual Biology classes in Germany as they do not cover all contents required by the curriculum
- Linguistic demands in English textbooks are too high for German students

Textbooks compared

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Authors	Title	Publisher
Jones, M. & G. Jones	<u>Biology</u>	CUP
Pickering, W.R.	Complete Biology	OUP
Martin, J.	Core Biology	CUP
Beckett, B.S. & R. Gallagher	Modular Science Biology	OUP
Beckett, B.S. & R. Gallagher	<u>All about Biology</u>	OUP
Bethell, G. & D. Coppock	Biology first	OUP
Haala, G. et al.	<u>Natura</u>	Klett
Jütte, M.	<u>Biologie heute entdecken</u>	Schroedel

[Titles underlined were taken into account for closer comparison]

Hypotheses (2nd strand)

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I. English textbooks are not suitable for the use in bilingual Biology classes in Germany as they do not cover all contents required by the curriculum.

II. Linguistic demands in English textbooks are too high for German students

Hypothesis I - content comparison - methods

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- Curriculum of the federal state North Rhine-Westphalia (NRW) as framework of reference
- Biological topic 'ecology' as field of investigation
- Content comparison of six English & two German textbooks by means of synoptical table

Hypothesis I - content comparison - results [Ecology]

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Topics demanded by the curriculum but (totally or almost:4-5)
missing in the English school science textbooks compared:

- Description of a chosen **habitat**
taking into account aspects of structure and abiotic factors
- **Plants** as part of the biocoenosis:
 - Special requirements of *seed plants* with local importance
 - Ecological importance of *mosses*
 - Reproduction, alternation of generations in *ferns*
- **Animals** as part of the biocoenosis:
 - *Insects*: Eyes, reproduction and development, Eusociality, Ecological aspects of chosen insect orders
 - *Annelids*: body function, locomotion, reproduction, habitat and ecological relations of the earthworm, importance for the improvement of soil quality
 - *Snails*: anatomy, locomotion, nutrition, reproduction
 - *Protozoa*: nutrition, habitat and ecological relations
- **Fungi** as part of the biocoenosis: Symbiosis between fungi and cormophytae or algae; edible mushrooms (classification of local mushrooms)
- Protection of the **environment** in the own town or region

Hypothesis I - content comparison - discussion

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- None of the English textbooks compared covers the topics prescribed by the curriculum completely
- For different topics, English textbooks differ in their degree of deviation from the German curriculum
- Thus, none of the English textbooks can be used solely and continuously in German bilingual Biology courses
- The need to compile and compare different English textbooks results in some extra work for teachers

Hypotheses (2nd strand)

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benötigt.

- I. English textbooks are not suitable for the use in bilingual Biology classes in Germany as they do not cover all contents required by the curriculum.

- II. Linguistic demands in English textbooks are too high for German students

Hypothesis II - linguistic demands - methods

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- Comparison of 'readability' of sample texts on the ecological topic of the carbon cycle
- Method: 'Cloze Procedure' by Taylor, 1953, with 2 [E] + 2 [G] sample texts
- Text length about 220 words, 43 gaps each; 3 bilingual classes (grade 8), 81 students in total; 45 min. working time; classes split half according to Biology marks
=> homogeneous subgroups for E+G & G+E sequences of test reading

Hypothesis II - linguistic demands - categories

[according to VAUGHAM, 1989]

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- Gaps filled in correctly < 40%:
text hardly understood at all
- Gaps filled in correctly 40-60%:
students need instruction to understand text
- Gaps filled in correctly > 60%:
text well understood

Hypothesis II - linguistic demands - results

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Results of the readability test. Average number of gaps filled in correctly.

Textbook	Average number of gaps filled in correctly (M)	Standard deviation (STD)	Gaps filled in correctly in relation to the total number of gaps (43) (%)
Biologie heute entdecken			
Natura			
All about Biology			
Biology			

Hypothesis II - linguistic demands - discussion

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- Students in this study - participants (grade 8) of the bilingual branch at their school - had less problems to understand the English text passages than the German ones (sic!)
- Thus, under the aspect of ‘readability’, English textbooks may be used exclusively in bilingual Biology classes
- It has to be asked whether students from bilingual Biology classes should really back up their teaching results with German textbooks at home - without any instruction

Conclusion (2nd strand)

(Uckelmann & Ewig, 2008, in: Scheersoi & Klein (Hrsg.),49-67)

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- Hypothesis I can be accepted - with reservations:
English textbooks are not suitable for the [exclusive] use
in bilingual Biology classes in Germany
as they do not cover all contents required by the curriculum.
- Hypothesis II must be rejected - for the texts and students chosen:
Linguistic demands in English textbooks are not too high
for German students - participating in a bilingual branch at their school.

C) Naming, knowing and protecting species - open questions for learning about „biodiversity“ ...

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- From 2005 to 2014 we are living in the **UN Decade of Education for Sustainable Development**
- One aspect of ESD refers to knowledge and protection of biodiversity, i.e. variety of plant and animal species
- From research in Biology Didactics we know: knowing species is a prerequisite for protection of species (cf. Berck 2005)
- Therefor Biology education
- among other objectives and
not only in the Decade of ESD -
aims at knowledge about the variety of plant and animal species, thus supporting the protection of biodiversity

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Names can foster - or hinder - knowledge of species...

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Spießente

[lit.: „Spear Duck“]

- Northern Pintail
- *Anas acuta*

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Schellente

[lit.: „Sond / Sund Duck“]

- Common Goldeneye
- *Bucephala clangula*

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Trauerente

[lit.: „Mourning Duck“]

- Black Scoter
- *Melanitta nigra*

Names can foster - or hinder - knowledge of species

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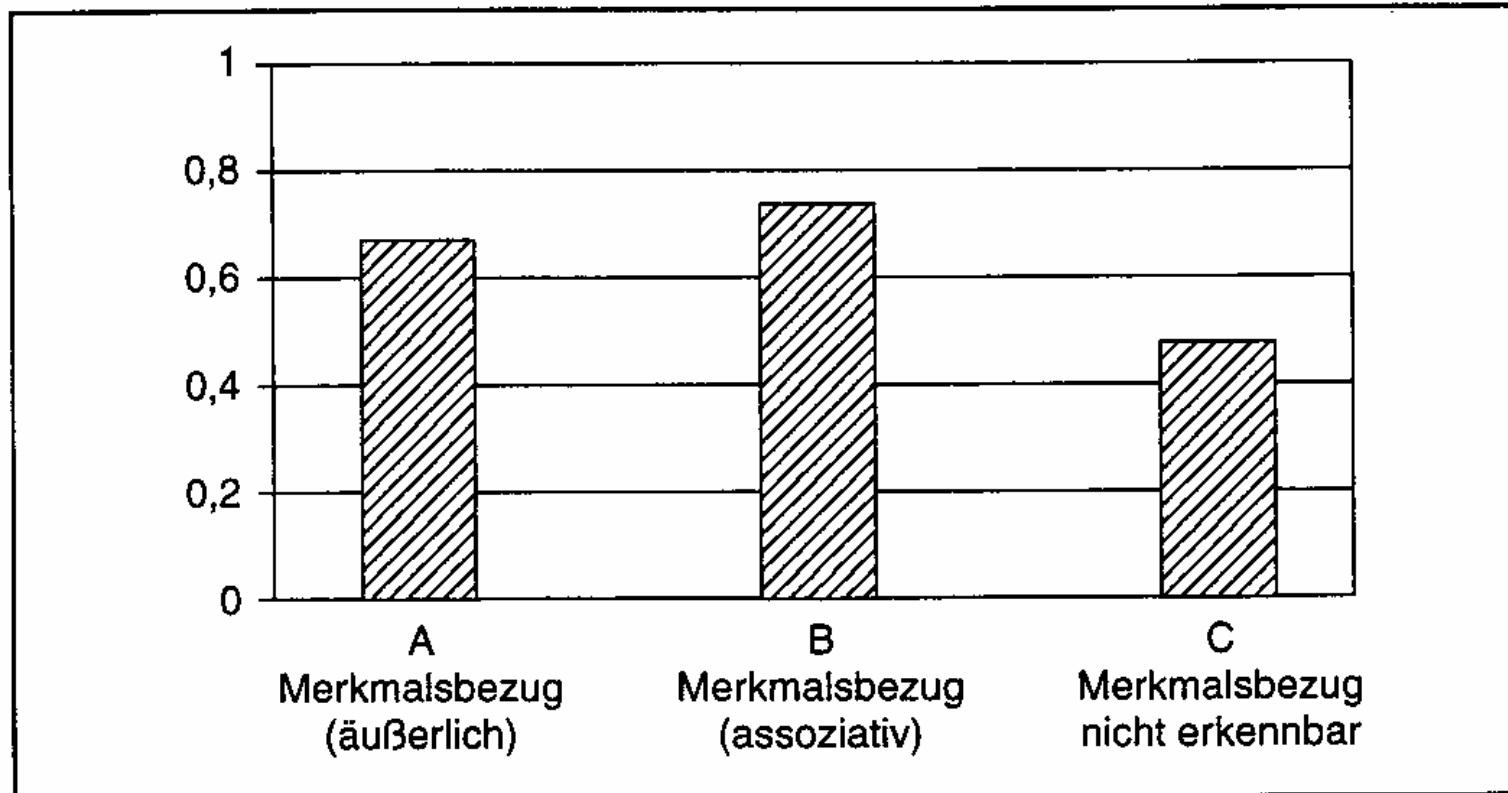


Abb. 1: Zahl richtiger Nennungen (Mittelwerte) pro Artnamen in den jeweiligen Kategorien. Werte können als Prozente interpretiert werden.

Q.: Randler & Metz (2005), PdN-BioS 6/54, 41-42

Names can foster - or hinder - knowledge of species - and their protection?...

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- Education for Sustainable Development also aims at protection of biodiversity - i.e. the variety of plant and animal species...
- ... protection of species depends on knowing the species...
- ... knowing of species depends on naming the species...
- ... naming of species depends on „easy“ associations...
- But: How about „easy“ associations when learning species names in a foreign language?

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