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iPhone App Additions- und Subtraktionstrainer

Bachelor Arbeit

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The LaTeX template from Karl Voit is based on KOMA script and can be found online: https://github.com/novoid/LaTeX-KOMA-template

Statutory Declaration

I declare that I have authored this thesis independently, that I have not used other than the declared sources/resources, and that I have explicitly marked all material which has been quoted either literally or by content from the used sources.

Graz, _____ _____

Date Signature

Eidesstattliche Erklärung[1]

Ich erkläre an Eides statt, dass ich die vorliegende Arbeit selbstständig verfasst, andere als die angegebenen Quellen/Hilfsmittel nicht benutzt, und die den benutzten Quellen wörtlich und inhaltlich entnommenen Stellen als solche kenntlich gemacht habe.

Graz, am _____ _____

Datum Unterschrift

[1] Beschluss der Curricula-Kommission für Bachelor-, Master- und Diplomstudien vom 10.11.2008; Genehmigung des Senates am 1.12.2008

Kurzfassung

Im Zuge meiner Bachelorarbeit, wurde eine native iPhone App als Ergänzung zu Benedikt Neuholds Additions- und Subtraktionstrainer entwickelt. Der Funktionsumfang besteht grundsätzlich aus 2 Teilen:

Als Primärfunktion wurde ein Online-Trainer entwickelt, der per Webservice abfrägt ob ein User Zugriff auf das System hat oder nicht, und der bei erfolgreicher Anmeldung beim Webservice, die für den User bestimmten Rechenaufgaben übermittelt bekommt. Diese Rechenaufgaben werden durch die App in grafisch ansprechender Weise präsentiert, und der/die BenutzerIn hat die Möglichkeit das Ergebnis einzugeben. Für die Auswertung der Rechenaufgaben werden die Ergebnisse, und auch alle Zwischenergebnisse in Form von Überträgen, mitgeloggt und nach Abschluss des Rechendurchlaufes wieder an das Webservice übermittelt wo das Ergebnis und der Lernfortschritt gespeichert wird.

Die Sekundärfunktion der App ist eine Offline-Übungsmöglichkeit, die in unterschiedlichen Schwierigkeitsstufen unauthorisiert/anonym durchführbar ist, und dem Zwecke der Verbesserung der Rechenfähigkeiten des Users dient.

Abstract

Over the course of my bachelor's thesis, an iPhone App has been developed as a supplement to Benedikt Neuholds Summation -and Subtraction Trainer. The range of usage possibilities of the App consists basically of two functions:

As a primary function, an Online-Trainer has been developed, asking Neuhold's System for access. If the user's authentication was successful, arithmetical problems are being submitted. These arithmetical problems are presented in an appealing graphical manner, with the possibility for the user to enter the result. For the purpose of the evaluation of the user's performance, the results and all intermediate results such as carries are being logged. After every computation iteration the results are being sent to Neuhold's System again, where they are being stored, together with the user's learning progress.

The secondary function of the App is an offline excercise, with the possibility to train the user's skills anonymously and in different difficulty levels.

Inhaltsverzeichnis

[2] **https://itunes.apple.com/de/app/mathboard/id373909837?mt=8**.
[3] **https://itunes.apple.com/de/app/addition-master-mathematik/id672669932?mt=8**.
[4] **https://itunes.apple.com/de/app/addition-!/id447548669?mt=8**.
[5] **https://itunes.apple.com/de/app/subtraction-!/id447548515?mt=8**.

Abbildungsverzeichnis

1 Einleitung

Zweifelsfrei hat das Aufkommen Mobiler Technologien und Smartphones mittlerweile große Auswirkungen auf unser tägliches Leben. Dazu gehört auch die Art wie wir heutzutage Lernen. Um dieser Tatsache Rechnung zu tragen wurde im Zuge dieser Arbeit eine iPhone Application (kurz App genannt) für Apple's Smartphone Betriebssystem iOS entwickelt, die Benedikt Neuhold bei seiner Diplomarbeit »Adaptives Informationssystem zur Erlernung mehrstelliger Addition und Subtraktion«[1] unterstützen soll.

Konkret geht es darum, dass es durch diese App für SchülerInnen unkompliziert und schnell möglich sein soll Additionen und Subtraktionen zu üben. Dazu melden sich die SchülerInnen über die iPhone App bei Neuhold's System an, und bekommen daraufhin auf ihre Bedürfnisse angepasste Rechenübungen die ihrem derzeitigen Wissensstand entsprechen. Der eigentliche Zweck der App besteht aber darin, dass die Ergebnisse und auch alle Zwischenergebnisse in Form von Überträgen protokolliert werden und in weiterer Folge an das bereits erwähnte System von Benedikt Neuhold zur Analyse weitergeleitet werden.

Da in erster Linie Kinder im Volksschulalter die Adressaten für Addition -und Subtraktionsübungen sind liegt ein wesentlicher Teil der Arbeit darin, die App so einfach wie möglich und dabei grafisch ansprechend zu gestalten, um die langfristige Motivation der SchülerInnen sicherzustellen.

Im folgenden Abschnitt 1.1 wird ein kurzer Überblick auf diese schriftliche Arbeit gegeben.

[1] Neuhold, 2013.

1.1 Gliederung der Arbeit

In Kapitel 2 wird kurz darauf eingegangen, welche Arbeiten es zu diesem Thema bereits gibt, und in welcher Form sich diese von der hier diskutierten Arbeit unterscheiden.

Kapitel 3 handelt von der technischen Umsetzung der App, das heißt es wird beschrieben welche Technologien zur Umsetzung der Arbeit verwendet wurden und wie diese im Kontext dieser App angepasst und verwendet wurden.

Gewonnene Ergebnisse sowie aufgetretene Probleme im Vorfeld der Arbeit, während der Umsetzung aber auch in der Nachbereitung werden in Kapitel 4 diskutiert.

Das vorletzte Kapitel 5 fasst die gesamte Arbeit mit all den gewonnenen Erkenntnissen noch einmal zusammen bevor in Kaptiel 6 ein Ausblick gewagt wird in welche Richtung sich das Thema des Mobilen Lernens hinentwickeln wird.

2 Stand der Technik

In diesem Kapitel werden Arbeiten zum Thema »Addition und Subtraktion mit mobilen Geräten« vorgestellt. Dabei handelt es sich vorwiegend um aktuelle iPhone Apps aus Apples' iTunes Store.[1] Diese Apps sind gewöhnlich für Kinder im Pflichtschulalter gedacht und dadurch auch meist grafisch ansprechend designt.

In den folgenden Abschnitten werden ein paar ausgewählte Apps vorgestellt.

2.1 MathBoard[2]

Diese App dient als Best Practice App im Bereich Mathematik. Aufgrunddessen wird sie auch von Apple selbst bei diversen Veranstaltungen präsentiert. In Abbildung 2.1 wird ein Screenshot dieser App gezeigt, auf dem sich aber erkennen lässt, dass der Funktionsumfang dieser App nicht wirklich mit der App die in dieser Arbeit präsentiert wird korreliert, und deswegen hier nur als »Best Practice« Beispiel angeführt wird.

2.2 Addition Master: Mathematik Spiel[3]

In Abbildung 2.2 ist ersichtlich, dass die Benutzeroberfläche dieser App, und dabei vor allem die Präsentation der Zahleneingabemöglichkeit sehr

[1] **https://itunes.apple.com/de/genre/ios/id36?mt=8**.
[2] **https://itunes.apple.com/de/app/mathboard/id373909837?mt=8**.
[3] **https://itunes.apple.com/de/app/addition-master-mathematik/id672669932?mt=8**.

Abbildung 2.1: Screenshot von Mathboard.

ähnlich der in dieser Arbeit vorgestellten App gestaltet wurde. Zum Funktionsumfang gehören hier:

- Trainingsmodus
- Statistik
- Übungsmodus

2.3 Addition ![4] and Subtraction ![5]

Hierbei handelt es sich um zwei separat existierende Apps vom selben Entwickler zum Thema Addition und Subtraktion. In der Recherche waren diese zwei Apps auch die einzigen, bei denen der/die SchülerIn Überträge zur Rechenerleichterung notieren konnte. Funktionalität:

- 2 oder 3 Summanden

[4] **https://itunes.apple.com/de/app/addition-!/id447548669?mt=8**.
[5] **https://itunes.apple.com/de/app/subtraction-!/id447548515?mt=8**.

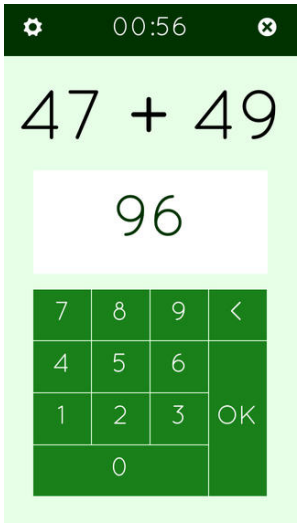

Abbildung 2.2: Screenshot von Addition Master: Mathematik Spiel.

- bis 6 Ziffern pro Summand
- Hilfe zur Problemstellung
- Tipp zur Problemstellung
- Tutorial in dem die App erklärt wird
- Editor für eigene Problemstellungen

In Abbildung 2.3 ist ein Screenshot der App »Addition !« zu sehen. Darauf ist ersichtlich, dass die Überträge über dem ersten Summanden einzutragen sind. Überträge über dem ersten Summanden zu notieren werden ist jedoch nur im englischsprachigen Raum üblich, im deutschsprachigen Raum werden die Überträge üblicherweise unter dem letzten Summanden notiert. In der in dieser Arbeit vorgestellten App ist es möglich die Felder für die Überträge entweder oben oder unten anzeigen zu lassen.

Abbildung 2.4 zeigt einen Screenshot der App »Subtraction !«. Dabei ist eine ausgeklügelte Methode zur Notierung der Überträge bei Subtraktionen ersichtlich.

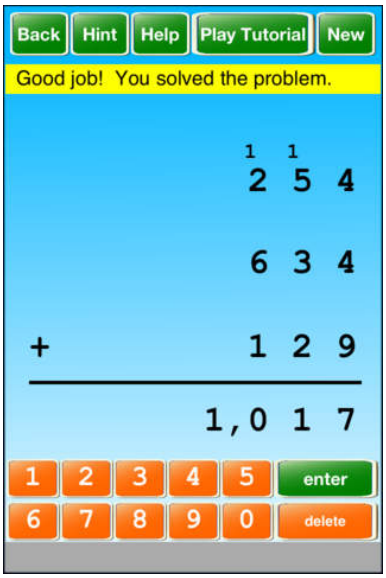

Abbildung 2.3: Screenshot von Addition !.

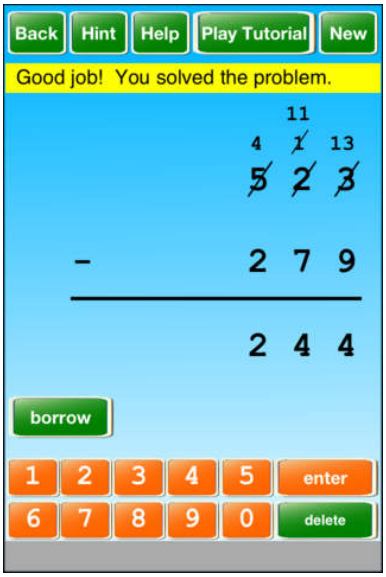

Abbildung 2.4: Screenshot von Subtraction !.

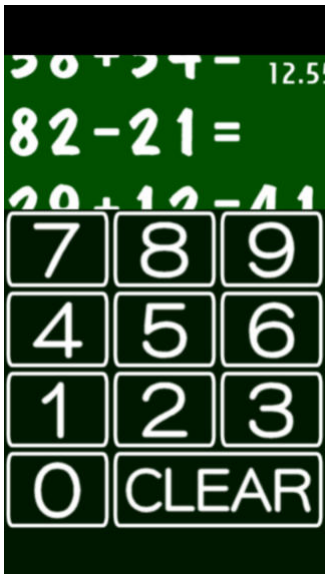

Abbildung 2.5: Screenshot von Add & Sub.

2.4 Weitere Apps

In diesem Abschnitt werden kurz weitere ausgewählte Apps im Bereich des mobilen Lernens vorgestellt.

Abbildung 2.5 zeigt die App »Add & Sub[8]«. Sie ist sehr einfach gehalten und auch in ihrem Funktionsumfang eingeschränkt.

Eine weitere Möglichkeit Mathematik Apps für Kinder attraktiv zu gestalten ist, die Apps als Spiele aufzubauen. Die Abbildungen 2.6 und 2.7 zeigen die Apps »Add & Sub with Springbird[9]« und »Addition & Subtraction For Kids[10]« die vor allem für SchülerInnen bis 10 Jahren auf dieses Prinzip setzt.

Weiters zu erwähnen sind die Apps:

[8] **https://itunes.apple.com/de/app/add-sub/id693077439?mt=8**.
[9] **https://itunes.apple.com/de/app/add-subtract-springbird-mathe/id601505771?mt=8**.
[10] **https://itunes.apple.com/de/app/addition-subtraction-for-kids/id426907035?mt=8**.

Abbildung 2.6: Screenshot von Add & Sub with Springbird.

Abbildung 2.7: Screenshot von Add & Sub For Kids.

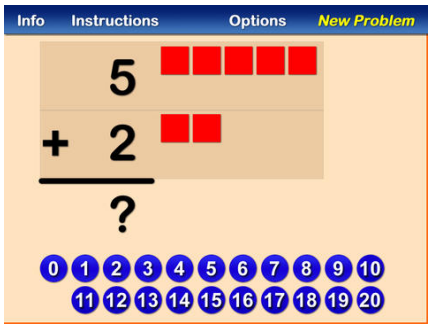

Abbildung 2.8: Screenshot von Add Sub K-1.

- »Add Sub K-1[11]« in Abbildung 2.8
- »Addition - Subtraction[12]« in Abbildung 2.9
- »Subtract with Fun[13]« in Abbildung 2.10

[11] **https://itunes.apple.com/de/app/add-sub-k-1/id486199509?mt=8.**
[12] **https://itunes.apple.com/de/app/addition-subtraction/id542109601?mt=8.**
[13] **https://itunes.apple.com/de/app/subtract-with-fun/id699563137?mt=8.**

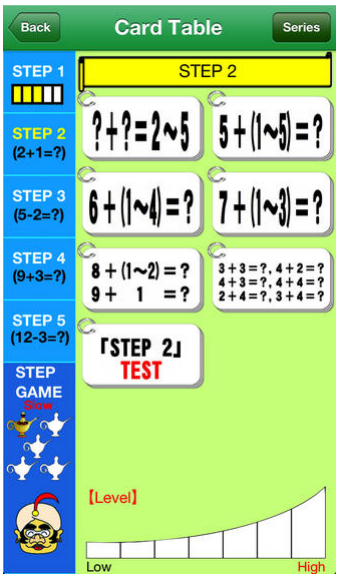

Abbildung 2.9: Screenshot von Addition - Subtraction.

Abbildung 2.10: Screenshot von Subtraction ith Fun.

3 Umsetzung

blabla

This is my text with an example Figure 7.1 and example citation Strunk und White, 1999 or Bringhurst (1993). And there is another »citation« which is located at the bottom[1].

Now you are able to write your own document. Always keep in mind: it's the *content* that matters, not the form. But good typography is able to deliver the content much better than information set with bad typography. This template allows you to concentrate on writing good content while the form is done by the template definitions.

Abbildung 3.1: Example figure.

[1] Voit, 2011.

4 Diskussion

blabla

This is my text with an example Figure 7.1 and example citation Strunk und White, 1999 or Bringhurst (1993). And there is another »citation« which is located at the bottom[1].

Now you are able to write your own document. Always keep in mind: it's the *content* that matters, not the form. But good typography is able to deliver the content much better than information set with bad typography. This template allows you to concentrate on writing good content while the form is done by the template definitions.

Abbildung 4.1: Example figure.

[1] Voit, 2011.

5 Zusammenfassung

blabla

This is my text with an example Figure 7.1 and example citation Strunk und White, 1999 or Bringhurst (1993). And there is another »citation« which is located at the bottom[1].

Now you are able to write your own document. Always keep in mind: it's the *content* that matters, not the form. But good typography is able to deliver the content much better than information set with bad typography. This template allows you to concentrate on writing good content while the form is done by the template definitions.

Abbildung 5.1: Example figure.

[1] Voit, 2011.

6 Ausblick

blabla

This is my text with an example Figure 7.1 and example citation Strunk und White, 1999 or Bringhurst (1993). And there is another »citation« which is located at the bottom[1].

Now you are able to write your own document. Always keep in mind: it's the *content* that matters, not the form. But good typography is able to deliver the content much better than information set with bad typography. This template allows you to concentrate on writing good content while the form is done by the template definitions.

Abbildung 6.1: Example figure.

[1] Voit, 2011.

7 Example Chapter

This is my text with an example Figure 7.1 and example citation Strunk und White, 1999 or Bringhurst (1993). And there is another »citation« which is located at the bottom[1].

Now you are able to write your own document. Always keep in mind: it's the *content* that matters, not the form. But good typography is able to deliver the content much better than information set with bad typography. This template allows you to concentrate on writing good content while the form is done by the template definitions.

Abbildung 7.1: Example figure.

[1] Voit, 2011.

8 Language and Writing Style

This chapter is an adopted version of a single chapter of Andrews thesis template Andrews, 2011 in its version from 2011-12-11.

The reason why Andrews, 2011 is not recommended to use instead of this template is its more »traditional« LaTeX implementation. But the contained information regarding »How to write a thesis« is generally brilliant and worth reading.

Using this chapter here is meant as a teaser. If you do like this chapter, please go and download the full template to read its content: Andrews, 2011.

What was modified from the original chapter:

- strikethrough of bad examples
- minor typographical details
- technical modifications
  - moved citations from `\citet{}` and `\citep{}` to `\textcite{}` and `\cite{}`
  - changed quoting style to `\enquote{}`
  - created various commands and environments to encapsulate format

The classic reference for English writing style and grammar is Strunk und White (1999). The original text is now available for free online Strunk, 1918, so there is no excuse at all for writing poor English. Readers should consult it first, then continue reading this chapter. Another good free guide is McCaskill (1998).

Zobel (2004) and Dupré (1998) are guides specifically aimed at computer science students. Phillips und Pugh (2005) gives practical advice for PhD students.

The following Sections 8.3 and 8.4 are adapted from the CHI'94 language and writing style guidelines.

8.1 Some Basic Rules of English

There are a few basic rules of English for academic writing, which are broken regularly by my students, particularly if they are non-native speakers of English. Here are some classic and often encountered examples:

- *Never* use I, we, or you.
  Write in the passive voice (third person).
  Bad: ~~You can do this in two ways.~~
  Good: There are two ways this can be done.
- *Never* use he or she, his or her.
  Write in the passive voice (third person).
  Bad: ~~The user speaks his thoughts out loud.~~
  Good: The thoughts of the user are spoken out loud.

  See Section 8.4 for many more examples.
- Stick to a consistent dialect of English. Choose either British or American English and keep to it throughout the whole of your thesis.
- Do *not* use slang abbreviations such as »it's«, »doesn't«, or »don't«.
  Write the words out in full: »it is«, »does not«, and »do not«.
  Bad: ~~It's very simple to…~~
  Good: It is very simple to…
- Do *not* use abbreviations such as »e. g.« or »i. e.«.
  Write the words out in full: »for example« and »that is«.
  Bad: ~~…in a tree, e. g.the items…~~
  Good: …in a tree, for example the items…

- Do *not* use slang such as »a lot of«.
  Bad: ~~There are a lot of features...~~
  Good: There are many features...

- Do *not* use slang such as »OK« or »big«.
  Bad: ~~...are represented by big areas.~~
  Good: ...are represented by large areas.

- Do *not* use slang such as »gets« or »got«.
  Use »becomes« or »obtains«, or use the passive voice (third person).
  Bad: ~~The radius gets increased...~~
  Good: The radius is increased...

  Bad: ~~The user gets disoriented...~~
  Good: The user becomes disoriented...

- *Never* start a sentence with »But«.
  Use »However,« or »Nevertheless,«. Or consider joining the sentence to the previous sentence with a comma.
  Bad: ~~But there are numerous possibilities...~~
  Good: However, there are numerous possibilities...

- *Never* start a sentence with »Because«.
  Use »Since«, »Owing to«, or »Due to«. Or turn the two halves of the sentence around.
- *Never* start a sentence with »Also«. Also should be placed in the middle of the sentence.
  Bad: ~~Also the target users are considered.~~
  Good: The target users are also considered.

- Do *not* use »that« as a connecting word.
  Use »which«.
  Bad: ~~...a good solution that can be computed easily.~~
  Good: ...a good solution which can be computed easily.

- Do *not* write single-sentence paragraphs.
  Avoid writing two-sentence paragraphs. A paragraph should contain at least three, if not more, sentences.

8.2 Avoid Austrianisms

I see these mistakes time and time again. Please do not let me read one of them in your work.

- »actual« ≠ »current«
  If you mean »aktuell« in German, you probably mean »current« in English.
  Bad: ~~The actual selection is cancelled.~~
  Good: The current selection is cancelled.
- »allows to« is not English.
  Bad: ~~The prototype allows to arrange components…~~
  Good: The prototype supports the arrangement of components…
- »enables to« is not English.
  Bad: ~~it enables to recognise meanings…~~
  Good: it enables the recognition of meanings…
- »according« ≠ »corresponding«
  Bad: ~~For each browser, an according package is created.~~
  Good: For each browser, a corresponding package is created.
- »per default« is not English.
  Use »by default«.
  Bad: ~~Per default, the cursor is red.~~
  Good: By default, the cursor is red.
- »As opposed to« is not English.
  Use »In contrast to«.
  Bad: ~~As opposed to C, Java is object-oriented.~~
  Good: In contrast to C, Java is object-oriented.
- »*anything*-dimensional« is spelt with a hyphen.
  For example: two-dimensional, three-dimensional.
- »*anything*-based« is spelt with a hyphen.
  For example: tree-based, location-based.
- »*anything*-oriented« is spelt with a hyphen.
  For example: object-oriented, display-oriented.
- »*anything*-side« is spelt with a hyphen.

For example: client-side, server-side.
- »*anything*-friendly« is spelt with a hyphen.
  For example: user-friendly, customer-friendly.
- »*anything*-to-use« is spelt with hyphens.
  For example: hard-to-use, easy-to-use.
- »realtime« is spelt with a hyphen if used as an adjective, or as two separate words if used as a noun.
  Bad: ~~. . . using realtime shadow casting.~~
  Good: . . . using real-time shadow casting.
  Bad: ~~. . . display the object in realtime.~~
  Good: . . . display the object in real time.

8.3 Clear Writing

The written and spoken language of your thesis is English as appropriate for presentation to an international audience. Please take special care to insure that your work is adapted to such an audience. In particular:

- Write in a straight-forward style, using simple sentence structure.
- Use common and basic vocabulary. For example, use »unusual« for »arcane«, and »specialised« for »erudite«.
- Briefly define or explain all technical vocabulary the first time it is mentioned, to ensure that the reader understands it.
- Explain all acronyms and abbreviations. For example, the first time an acronym is used, write it out in full and place the acronym in parentheses.
  Bad: ~~. . . When using the GUI version, the use may. . .~~
  Good: . . . When using the Graphical User Interface (GUI) version, the use may. . .
- Avoid local references. For example, not everyone knows the names of all the provincial capitals of Austria. If local context is important to the material, describe it fully.
- Avoid »insider« comments. Ensure that your whole audience understands any reference whose meaning you do not describe. For example,

do not assume that everyone has used a Macintosh or a particular application.
- Do not »play on words«. For example, do not use »puns«, particularly in the title of a piece. Phrases such as "red herring" require cultural as well as technical knowledge of English.
- Use unambiguous formats to represent culturally localised things such as times, dates, personal names, currencies, and even numbers. 9/11 is the 9th of November in most of the world.
- Be careful with humour. In particular, irony and sarcasm can be hard to detect if you are not a native speaker.
- If you find yourself repeating the same word or phrase too often, look in a thesaurus such as Roget (2004); Roget (1995) for an alternative word with the same meaning.

Clear writing experts recognise that part of writing understandable documents is understanding and responding to the needs of the intended audience. It is the writer's job to maintain the audience's willingness to go on reading the document. Readers who are continually stumped by long words or offended by a pompous tone are likely to stop reading and miss the intended message.

8.4 Avoiding Gender Bias

Part of striking the right tone is handling gender-linked terms sensitively. Use of gender terms is controversial. Some writers use the generic masculine exclusively, but this offends many readers. Other writers are experimenting with ways to make English more neutral. Avoiding gender bias in writing involves two kinds of sensitivity:

1. being aware of potential bias in the kinds of observations and characterisations that it is appropriate to make about women and men, and
2. being aware of certain biases that are inherent in the language and of how you can avoid them.

The second category includes using gender-specific nouns and pronouns appropriately. Here are some guidelines for handling these problems:

- Use a gender-neutral term when speaking generically of people:

man	the human race
mankind	humankind, people
manpower	workforce, personnel
man on the street	average person

- Avoid clearly gender-marked titles. Use neutral terms when good ones are available. For example:

chairman	chairperson
spokesman	speaker, representative
policeman	police officer
stewardess	flight attendant

- If you are speaking of the holder of a position and you know the gender of the person who currently occupies the position, use the appropriate gender pronoun. For example, suppose the »head nurse« is a man:
  Bad: ~~The head nurse must file her report every Tuesday.~~
  Good: The head nurse must file his report every Tuesday.

- Rewrite sentences to avoid using gender pronouns. For example, use the appropriate title or job name again:
  Bad: ~~Interview the user first and then ask him to fill out a questionnaire.~~
  Good: Interview the user first and then ask the user to fill out a questionnaire.

- To avoid using the third person singular pronoun (his or her), recast your statement in the plural:
  Bad: ~~Each student should bring his text to class.~~
  Good: All students should bring their texts to class.

- Address your readers directly in the second person, if it is appropriate to do so:
  Bad: ~~The student must send in his application by the final deadline date.~~
  Good: Send in your application by the final deadline date.

- Replace third person singular possessives with articles.
  Bad: ~~Every student must hand his report in on Friday.~~
  Good: Every student must hand the report in on Friday.

- Write your way out of the problem by using the passive voice.
  Bad: ~~Each department head should do his own projections.~~
  Good: Projections should be done by each department head.
- Avoid writing awkward formulations such as »s/he«, »he/she«, or »his/her«. They interfere when someone is trying to read a text aloud. If none of the other guidelines has been helpful, use the slightly less awkward forms »he or she«, and »his or hers«.

Remember, the goal is to avoid constructions that will offend your readers so much as to distract them from the content of your work.

8.5 Titles and Headings in Initial Caps

8.6 Use a Spelling Checker

In these days of high technology, spelling mistakes and typos are inexcusable. It is *very* irritating for your supervisor to have to read through and correct spelling mistake after spelling mistake which could have been caught by an automated spelling checker. Believe me, irritating your supervisor is not a good idea.

So, use a spelling checker *before* you hand in *any* version, whether it is a draft or a final version. Since this is apparently often forgotten, and sometimes even wilfully ignored, let me make it absolutely clear:

Use a spelling checker, please.
Use a spelling checker!
Use a spelling checker, you moron.

8.7 Use a Dictionary

If you are not quite sure of the meaning of a word, then use a dictionary. dictionary.com (2004) is a free English dictionary, Chemnitz (2004) and Leo (2004) are two very good English-German dictionaries.

8.8 Use a Thesaurus

If a word has been used several times already, and using another equivalent word might improve the readability of the text, then consult a thesaurus. Roget (2004) and Roget (1995) are free English thesauri.

Appendix

Literatur

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