Cross-Cultural Evaluation of Politeness in Tactics for Pedagogical Agents

W. Lewis Johnson[1], Richard E. Mayer[2], Elisabeth André[3], Matthias Rehm[3]
[1]*USC / Information Sciences Institute, 4676 Admiralty Way, Marina del Rey, CA 90292*
[2]*University of California, Santa Barbara*
[3]*University of Augsburg, Institute for Computer Science, Eichleitnerstr. 30, Germany*

Abstract. Politeness may play a role in tutorial interaction, including promoting learner motivation and avoiding negative affect. Politeness theory can account for this as a means of mitigating the face threats arising in tutorial situations. It further provides a way of accounting for differences in politeness in different cultures. Research in social aspects of human-computer interaction predict that similar phenomena will arise when a computer tutor interacts with learners, i.e., they should exhibit politeness, and the degree of politeness may be culturally dependent.
To test this hypothesis, a series of experiments was conducted. First, American students were asked to rate the politeness of possible messages delivered by a computer tutor. The ratings were consistent with the conversational politeness hypothesis, although they depended upon the level of computer literacy of the subjects. Then, the materials were translated into German, in two versions: a polite version, using the formal pronoun Sie, and a familiar version, using the informal pronoun Du. German students were asked to rate these messages. Ratings of the German students were highly consistent with the ratings given by the American subjects, and the same pattern was found across both pronoun forms.

1. Introduction

Animated pedagogical agents are capable of rich multimodal interactions with learners [6, 14]. They exploit people's natural tendency relate to interactive computer systems as social actors [16], to respond to them as if they have human qualities such as personality and empathy. In particular, pedagogical agents are able to perform affective and motivational scaffolding [2, 4, 9]. Educational researchers have increasingly called attention to the role of affect and motivation in learning [13, 17] and the role of expert tutoring in promoting affective and motivational states that are conducive to learning [11, 12]. Pedagogical agents are being developed that emulate motivational tutoring tactics, and they can positively affect learner attitudes, motivational state, and learning gains [18].

We use the politeness theory of Brown and Levinson [3] as a starting point for modelling motivational tactics. Politeness theory provides a general framework for analyzing dialog in social situations, and in particular the ways in which speakers mitigate face threats. When human tutors interact with learners they constantly risk threatening the learner's face, by showing disapproval or taking control away from the learner. They can also enhance learner face by showing approval and respect for the learner's choices. This in turn can have an impact on the learner's attitude and motivation. Johnson et al. [10] have developed a model for characterizing tutorial dialog moves in terms of the amount of face threat redress they exhibit, and implemented it in a tutorial tactic generator that can vary the manner in which a tutorial dialog move is realized depending upon the degree of attention paid to the learner's face and motivational state.

An interesting aspect of Brown and Levinson's theory is that it applies to all languages and cultures. Every language has a similar set of methods for mitigating face threat; however, not all cultures ascribe equal importance to each type of face threat. Using politeness theory as a framework, it is possible to create tutorial tactics in multiple languages and compare them to assess their impact in different cultures.

This paper presents a study that performs just such a comparison. German subjects evaluated the degree of face threat mitigation implied by a range of tutorial tactics for a pedagogical agent. These ratings were compared against similar ratings by American subjects of pedagogical agent tactics in English. The ratings by the subjects were in very close agreement. Use of formal vs. informal pronouns, a cardinal indicator of formality in German, did not have a significant effect on ratings of face threat mitigation. These results have implications for efforts to adapt pedagogical agents for other languages and cultures, or to create multilingual pedagogical agents (e.g., [8]).

2. Background: Politeness Theory and Tutorial Dialog

An earlier study analyzed the dialog moves made by a human tutor working with learners on a computer-based learning environment for industrial engineering [7]. It was found that the tutor very rarely gave the learners direct instructions as to what to do. Instead, advice was phrased indirectly in the form of questions, suggestions, hints, and proposals. Often the advice was phrased as a proposal of what the learner and tutor could do jointly (e.g., "So why don't we go back to the tutorial factory?"), when in reality the learner was carrying out all of the actions. Overall, tutorial advice was found to fall into one of eight categories: (1) direct commands (e.g., "Click the ENTER button"), (2) indirect suggestions (e.g., "They are asking you to go back and maybe change it"), (3) requests, (4) actions expressed as the tutor's goals (e.g., "Run your factory, that's what I'd do"), (5) actions as shared goals, (6) questions, (7) suggestions of student goals ("e.g., "you will probably want to look at the work centres"), and (8) Socratic hints (e.g., "Well, think about what you did.").

Brown & Levinson's politeness theory provides a way to account for these indirect tutorial dialog moves. According to politeness theory, all social actors have *face wants*: the desire for *positive face* (being approved of by others) and the desire for *negative face* (being unimpeded by others). Many conversational exchanges between people, (e.g., offers, requests, commands) potentially threaten positive face, negative face, or both. To avoid this, speakers employ various types of face threat mitigation strategies to reduce the impact on face. Strategies identified by Brown and Levinson include positive politeness (emphasizing approval of the hearer), negative politeness (emphasizing the hearer's freedom of action, e.g., via a suggestion) and off-record statements (indirect statements that imply that an action is needed). The eight categories listed above fit naturally as subcategories of Brown and Levinson's taxonomy, and can be understood as addressing the learner's positive face, negative face, or both. In this corpus positive face is most often manifested by shared goals (the willingness to engage in shared activity with someone implies respect for that person's contributions). We hypothesize that tutors adjust their modes of address with learners not just to mitigate face threat, but also to enhance the learners' sense of being approved of and free to make their own choices. These in turn can have an influence on the learners' self-confidence, and these factors have been found by researchers on motivation (e.g. [12]) to have an impact on learner motivation.

Based on this analysis, Johnson and colleagues [11] developed a tutorial dialog generator that automatically selects an appropriate form for a tutorial dialog move, based on the social distance between the tutor and the learner, the social power of the tutor over the learner, the degree of influence the tutor wishes to have on the learner's motivational state, the type of face threatening action, and the degree of face threat mitigation afforded by each type of tutorial

dialog move. The dialog generator utilizes a library of tutorial tactics, each of which is annotated according to the amount of redress that tactic gives to the learner's positive face and negative face. Once each tactic is annotated in terms of negative and positive face, the generator can choose appropriate tactics automatically.

To make this scheme work, it is necessary to obtain appropriate positive politeness and negative positive politeness ratings for each tactic. These ratings were obtained using an experimental method described in [13]. Two groups of instances of each of the eight tactic categories were constructed (see appendix). One set, the A group, consisted of recommendations to click the ENTER button on a keyboard. The B group consisted of suggestions to employ the quadratic formula to solve an equation. Two different types of advice were given in case the task context influences the degree of face threat implied by a particular suggestion. These advice messages were then presented to 47 experimental subjects at the University of California, Santa Barbara (UCSB), who were told to evaluate them as possible messages given by computer tutor. Each message was rated according to the degree to which it expressed respect for the user's choices (negative politeness) and a feeling of working with the user (positive politeness). The main findings were as follows:

- With this experimental instrument, subjects ascribed degrees of positive and negative politeness with a high degree of consistency;
- The rankings of the ratings were consistent with the rankings proposed by Brown and Levinson, suggesting that the subjects ascribed politeness to the computer tutor as if it were a social actor;
- The task context did not have a significant effect on the politeness ratings;
- Ratings of politeness *did* depend upon the amount of computer experience of the subjects—experienced computer users were more tolerant impolite tutor messages than novice computer users were.

Based upon these findings, it was concluded that politeness theory could be validly applied to dialog with a pedagogical agent, and that the average ratings for each type of tactic obtained from the study could be used to calibrate the tutorial tactic generator, possibly adjusting for the level of computer experience of the user.

3. Experimental Evaluation of Politeness in German

Having successfully applied to politeness theory to the choice of tutorial tactics in English, we then considered the question of whether it might equally apply to tutorial tactics in German. Politeness theory is claimed by Brown and Levinson to apply to dialog in all languages and cultures; however not all cultures attribute the same degree of face threat to a given face threatening act. We therefore attempted to replicate the UCSB study in German. We anticipated that the ratings given by German subjects might differ from the American ratings for any of the following reasons:

- Politeness theory might not apply cross-culturally to human-computer interaction as it does to human-human interaction;
- Certain face threats might be regarded as more serious in one culture than in the other;
- Human tutors in Germany might have different power or social distance relationships with human students, affecting the amount of face threat that learners tolerate;
- Translating the messages into German might introduce cultural issues that are absent in English and yet have an impact on perceived politeness.

The participants for the German experiments were 83 students from Augsburg University. Thirty-nine students were recruited from the Philosophy department while 44 students were recruited from the Computer Science department. One subject indicated using a computer 1 to 5 hours per week, 11 indicated using a computer 5 to 10 hours per week, 26 indicated using a

computer 10 to 20 hours per week, and 45 indicated using a computer more then 20 hours per week. The mean age of the subjects was 22.8 years (SD=1.997). There were 37 women and 46 men. Seventy-eight of the 83 students reported German as their native language.

For the German experiment, we devised a German version of the original English questionnaire. We tried to find translations that closely matched the original English documents, but nevertheless sounded natural to native speakers of German. During the translation, the question arose of how to translate the English "you". There are different ways of saying "you" in German depending on the degree of formality. In German, the more familiar "Du" is used when talking to close friends, relatives or children, while people tend to use the more formal "Sie" when talking to adults they do not know very well or to people that have a high status. Whether to use "Sie" or "Du" may constitute a difficult problem both for native speakers of German and foreigners. On the one hand, the "Du" address form might be considered as impolite or even abusive. On the other hand, switching to the "Sie" address form may be interpreted as a sign that the interlocutor wishes to maintain distance. A German waiter in the pub that is mostly frequented by young people is in a dilemma when she has to serve somebody of an older age. Some customers might consider the "Du" as disrespectful. Other might be irritated by the "Sie" since it makes them aware of the fact that they belong to an older age group. Similar dilemmas may occur in the academic context. Most German professors would use "Sie" when addressing undergraduates, but "Du" is common as well.

Since address forms are an important means to convey in-group membership (see also [3]), we expected that the use of "Sie" or "Du" might have an impact on the students' perception of politeness. In particular, we assumed that the students might perceive an utterance as more cooperative if the "Du" is used (positive politeness). Furthermore, the students might feel under higher pressure to perform a task if the teacher conveys more authority (negative politeness).

To investigate these questions, we decided to divide the subjects into two groups. Thirty-seven students were presented with the more formal "Sie" version and 46 students were presented with the more confidential "Du" version of the questionnaire. That is, the variable "address form" was manipulated between subjects while comparisons concerning types of statements were within subject comparisons.

Do the two kinds of politeness rating correspond for the English and the German version?

Table 1 gives the mean ratings for each of the 16 sentences for the English and the German experiment on the rating scale for negative and positive politeness. Items were rated on a scale from 1 (least polite) to 7 (most polite). The items are listed in order of negative/positive politeness for the US condition. As in the US experiment, the most impolite statements are direct commands and commands attributed to the machine whereas the most polite statements are guarded suggestions and "we" constructions that indicate a common goal.

For set B, there are just two permutations between two neighbour positions (B1 $\leftrightarrow$ B2, B6 $\leftrightarrow$ B7) in the case of positive politeness. In the case of negative politeness the order of the statements of set B completely coincide. For set A, the order of the statements differs to a higher degree. In particular, item A5 got a much lower rating for negative politeness in Germany than in the US. As a reason, we indicate that the utterance "Drücken wir die ENTER Taste" (Let's click the ENTER button.) sounds rather patronizing in German which might have evoke the feeling in the students that the agent does not respect their freedom. This patronising impression engendered by the first person plural is not unique to German; for example, in English adults sometimes use this form when giving commands to children (e.g., "OK, Johnnie, let's go to bed now"). Nevertheless, the effect was obviously stronger for the German version, but interestingly only occurred for negative politeness. Both the American and the German subjects gave A5 the highest rating in terms of positive politeness.

Mean Ratings for Neg. Politeness for the Experiments Conducted in the US and in Germany

	A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	B5	B4	B3	B8	B6	B7
US	1.75	2.72	2.89	3.17	3.34	4.28	4.51	5.85	1.79	2.75	3.26	3.32	3.79	4.11	4.70	4.83
D	1.42	2.70	2.65	3.70	1.93	4.35	4.06	5.49	1.43	2.10	3.31	3.76	4.08	4.17	4.60	5.39

Mean Ratings for Pos. Politeness for the Experiments Conducted in the US and in Germany

	A1	A2	A4	A3	A6	A8	A7	A5	B2	B1	B4	B8	B3	B6	B7	B5
US	2.53	2.94	3.32	3.85	4.09	4.11	4.83	5.17	3.06	3.09	4.04	4.43	4.79	4.89	4.95	5.26
D	3.04	2.87	3.98	3.28	4.72	4.83	4.48	4.87	2.45	2.41	4.27	4.27	5.04	5.23	5.20	5.66

Table 1: Comparison of the Experimental Results Obtained in the US and in Germany

Overall, the Pearson correlation between the US and German ratings of positive politeness for the 16 statements is $r = .926$ which is highly significant ($p < .001$). The correlation for US and German ratings of negative politeness for the 16 statements is $r = .893$ which is highly significant ($p < .001$) as well. This means that we can conclude that German and American users responded to the politeness level of our statements in the same way.

An analysis of variance conducted on the 8 items revealed that the ratings differed significantly from each other for negative politeness ($F(7,574)=100.6022$, $p <.001$ for set A, $F(7,574)=98.8674$, $p<.001$ for set B) and for positive politeness ($F(7,574)=21.8328$, $p <.001$ for set A, $F(7,574)=51.3999$, $p <.001$ for set B).

Do the two forms of the sentences correspond in the German version?

As in the US experiment, we analyzed whether the statements in set A conveyed the same politeness tone as the corresponding statements in set B. To accomplish this task, we computed Pearson correlations among the ratings of the 83 students on each pair of corresponding items (e.g., A1 and B1, A2 and B2, etc.) on each scale. Among the items on the first rating scale, only A1 and B1, A2 and B2, A4 and B4 as well as A6 and B6 correlated significantly at the .01 level. Among the items on the second rating scale, A1 and B1, A2 and B2, A4 and B4, A5 and B5, and A6 and B6 correlated significantly at the .01 level and A3 and B3 at the .05 level. There was no such strong correlation between A8 and B8 and A7 and B7 on any of the two scales. Overall, the students found the utterance „Möchten Sie die ENTER Taste drücken?“ (Do you want to click the ENTER button?) more polite (on both scales) than „Haben Sie die Quadratformel verwendet, um diese Gleichung zu lösen?“ (Did you use the quadratic formula to solve this equation). Furthermore, the utterance „Sie könnten die Quadratformel verwenden, um diese Gleichung zu lösen.“ (You could use the quadratic formula to solve this equation.) was perceived as more polite (on both scales) than „Sie möchten wohl die ENTER Taste drücken.” (You may want to click the ENTER button). Since the direct translation of the English sentence sounded rather unusual, we decided to add the discourse particle “wohl” (well). In connection with “möchten” (want), “wohl” is, however, frequently be used to signal the addressee that she will not be able to perform the intended action. We assume that a more neutral wording “möchten wahrscheinlich” (probably want) instead of “möchten wohl” (well want) would have led to different results.

Does the address form “Du” or “Sie” in the German experiment make any difference?

Table 2 gives the mean rating for the 16 statements for negative and positive politeness in the “Du” and “Sie” conditions. The statements are listed in order of negative and positive politeness respectively. As you can see, the order of the sentences of set A and B does not differ drastically for the “Du” and the “Sie” version.

Mean Ratings for Negative Politeness

	A1	A5	A3	A2	A4	A7	A6	A8	B1	B2	B5	B4	B3	B8	B6	B7
Du	1.43	2.11	2.70	2.72	3.46	4.04	4.33	5.64	1.50	2.04	3.48	3.78	3.87	4.41	4.70	5.28
Sie	1.41	1.70	2.59	2.68	4.00	4.08	4.38	5.32	1.35	2.16	3.11	3.73	4.35	3.86	4.49	5.51

Mean Ratings for Positive Politeness

	A1	A2	A3	A4	A7	A6	A8	A5	B2	B1	B4	B8	B3	B6	B7	B5
Du	3.22	3.09	3.39	4.07	4.24	4.70	4.76	5.07	2.61	3.50	4.13	4.30	5.13	5.15	5.20	5.65
Sie	2.81	2.59	3.14	3.86	4.78	4.76	4.92	4.62	2.24	3.30	4.43	4.22	4.92	5.32	5.11	5.68

Table 2: Comparison of the Experimental Results for the "Du" and "Sie" Conditions

Overall, the Pearson correlation between the "Du" and the "Sie" version for negative politeness is $r = .974$ which is highly significant ($p < .001$). The correlation between Du and Sie forms for positive politeness is $r = .968$ which also is very strong ($p < .001$). The experiment clearly shows that the use of the address form did not influence the subjects' perception of politeness. Since the students were not given detailed information on the situational context, they obviously assumed a setting which justified the used address form. That is, the choice of an appropriate address form ensured a basic level of politeness, but did not combine additively with other conversational tactics.

4. Related Work

There has been a significant amount of research on universal and culture-specific aspects of politeness behaviours. Most noteworthy is the work by House who performed a series of contrastive German-English discourse analyses over the past twenty years, see [5] for a list of references. Among other things, she observed that Germans tend to be more direct, and more self-referenced, and resort less frequently to using verbal routines. While House focused on the analysis of spoken or written discourse, we were primarily interested in ranking communication tactics derived from a corpus of tutorial dialogues according to their perceived level of politeness. Hardly any work has addressed the cultural dimension of politeness behaviours in the context of man-machine communication so far.

Our work is closely related to the work of Porayska-Pomsta [15] analyzing politeness in instructional dialogs in the United States and Poland. Porayska-Pomsta also observes close similarities between the role of politeness in American tutorial dialogs and Polish classroom dialogs. However the two corpora that she studied were quite different in nature: one is text-based chat and the other is in-class dialog. It is therefore difficult to make the same kinds of quantitative comparisons between the two data sets that we have made here.

Alexandris and Fotinea [1] investigate the role of discourse particles as politeness markers to inform the design of a Greek Speech Technology application for the tourist domain. They performed a study in which evaluators had to rank different variations of written dialogues according to their perceived degree of naturalness and acceptability. The study revealed that dialogues in Modern Greek with discourse particles indicating positive politeness are perceived as friendlier and more natural while dialogues without any discourse particles or discourse particles fulfilling other functions were perceived as unnatural. The authors regard these findings as cultural-specific elements of the Greek language.

5. Conclusions

These studies have demonstrated that politeness theory applies equally to tutorial dialog tactics in English and in German, applied by pedagogical agents, as evaluated by university students

in the United States and Germany. Politeness ratings are remarkably similar between the two languages and cultures. The "Du"/"Sie" distinction, which can be an important indicator of social standing in German society, does not have a significant influence on perceived politeness. There are some slight differences in judgments of politeness in individual cases, in part because direct translations are not always possible and the best equivalent translations sometimes connote a somewhat different degree of politeness. Nevertheless, the degree of correlations between American and German ratings is quite high. Obviously, the eight categories of commands retrieved from the US corpus are common in German tutorial dialogues as well. It would appear that tutorial tactics falling into these classes can be translated fairly freely between the German and American educational contexts, although one has to be careful to consider that possibility that individual tactics may have different politeness connotations in the other language.

These results are further evidence for the contention that developers of intelligent tutors should take into account the possibility that learners will relate to the tutors as if they were social actors.

Acknowledgments

This work was funded by the National Science Foundation under Grant No. 0121330, the EU Network of Excellence Humaine and BaCaTec. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

References

[1] Alexandris, C., & Fotinea, S. (2003). Discourse Particles: Indicators of Positive and Non-Positive Politeness in the Discourse Structure of Dialog Systems for Modern Greek. In: *SDV - Sprache und Datenverarbeitung*, Jahrgang 28, Heft 1, pp. 22-33, 2004.

[2] Bickmore, T. (2003). *Relational agents: Effecting change through human-computer relationships.* Ph.D. thesis, Massachusetts Institute of Technologgy.

[3] Brown, P., & Levinson, S. C. (1987). *Politeness: Some universals in language use.* New York: Cambridge University Press.

[4] Conati, C. & Zhao, X. (2004). Building and evaluating an intelligent pedagogical agent to improve the effectiveness of an educational game. Proceedings of IUI'04. New York: ACM Press.

[5] House, J. (2000). Understanding Misunderstanding: A Pragmatic Discourse Approach to Analysing Mismanaged Rapport in Talk Across Cultures. In: Spencer-Oatey, H. (Eds.). *Culturally Speaking: Managing Rapport Through Talk Across Cultures* . London: Cassell Academic.

[6] Johnson, W.L., Rickel, J., & Lester, J. (2000). Animated pedagogical agents: Face to face interaction in interactive learning environments. *IJAIED* 11:47-78.

[7] Johnson. W.L. (2003). Interaction tactics for socially intelligent pedagogical agents. *Proc. of the Int'l Conf. on Intelligent User Interfaces*, 251-253. New York: ACM Press, 2003.

[8] Johnson, W.L., LaBore, C., & Chiu, J. (2004). A pedagogical agent for psychosocial intervention on a handheld computer. AAAI Fall Symposium on Health Dialog Systems.

[9] Johnson, W. L., Rizzo, P. (2004). Politeness in tutorial dialogs: "Run the factory, that's what I'd do." *Proc. of the 7th International Conference on Intelligent Tutoring Systems.* Berlin: Springer.

[10] Johnson, W.L., Rizzo, P., Bosma, W., Kole, S., Ghijsen, M., & van Welbergen, H. (2004). Generating socially appropriate tutorial dialog. *Proceedings of ADS '04*. Berlin: Springer.

[11] Johnson, W.L., Wu, S., & Nouhi, Y. (2004). Socially intelligent pronunciation feedback for second language learning. ITS '04 Workshop on Social and Emotional Intelligence in Learning Environments.

[12] Lepper, M. R., Woolverton, M., Mumme, D., & Gurtner, J. (1993). Motivational techniques of expert human tutors: Lessons for the design of computer-based tutors. In S. P. Lajoie and S. J. Derry (Eds.), *Computers as cognitive tools* (pp. 75-105). Hillsdale, NJ: Erlbaum.

[13] Mayer, R.E., Johnson, W.L, Shaw, E., & Sandhu, S. (2005). Constructing Computer-Based Tutors that are Socially Sensitive: Politeness in Educational Software. Paper presented at the annual conference of the American Educational Research Association. Montreal, Canada.

[14] Moreno, R. (in press). Multimedia learning with animated pedagogical agents. In R. E. Mayer (Ed.), *Cambridge handbook of multimedia learning*. New York: Cambridge University Press.
[15] Porayska-Pomska, K. (2003). *The influence of situational context of language production: Modeling teachers' corrective responses*. Ph.D. thesis, Univesity of Edinburgh.
[16] Reeves, B., & Nass, C. (1996). *The media equation*. New York: Cambridge University Press.
[17] Sansone, C., and Harackiewicz, J. M. (2000). *Intrinsic and extrinsic motivation: The search for optimal motivation and performance.* San Diego: Academic Press.
[18] Wang, N., Johnson, W.L., Rizzo, P., Shaw,E., & Mayer, R. (2005). Experimental evaluation of polite interaction tactics for pedagogical agents. Proceedings of IUI '05. New York: ACM Press.

Appendix

A1 Click the ENTER button. / Drücken Sie die ENTER Taste.
A2 The system is asking you to click the ENTER button. / Das System bittet Sie, die ENTER Taste zu drücken.
A3 I would like you to click the ENTER button. / Ich hätte gerne, dass Sie die ENTER Taste drücken.
A4 I would now click the ENTER button. / Ich würde nun die ENTER Taste drücken.
A5 Let's click the ENTER button. / Drücken wir die ENTER Taste.
A6 And what about the ENTER button? /Und wie wäre es mit dem Drücken der ENTER Taste?
A7 You may want to click the ENTER button. / Sie möchten wohl die ENTER Taste drücken.
A8 Do you want to click the ENTER button? / Möchten Sie die ENTER Taste drücken?

B1 Now use the quadratic formula to solve this equation. / Nun verwenden Sie die Quadratformel, um diese Gleichung zu lösen.
B2 The machine wants you to use the quadratic equation. / Die Maschine möchte, dass Sie die Quadratformel verwenden, um diese Gleichung zu lösen.
B3 I suggest that you use the quadratic formula to solve this equation. / Ich schlage vor, dass Sie die Quadratformel verwenden, um diese Gleichung zu lösen.
B4 I would use the quadratic formula to solve this equation. / Ich würde die Quadratformel verwenden, um diese Gleichung zu lösen.
B5 We should use the quadratic formula to solve this equation. / Wir sollten die Quadratformel verwenden, um diese Gleichung zu lösen.
B6 What about using the quadratic formula to solve this equation? / Wie wäre es, wenn Sie die Quadratformel verwenden würden, um diese Gleichung zu lösen?
B7 You could use the quadratic formula to solve this equation. / Sie könnten die Quadratformel verwenden, um diese Gleichung zu lösen.
B8 Did you use the quadratic formula to solve this equation? / Haben Sie die Quadratformel verwendet, um diese Gleichung zu lösen?