Summary of Empirical Research on Experiences and Interventions to Develop Teacher Leadership

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Summary of research on experiences and interventions to develop teacher leadership

The knowledge and skills of teacher leaders are often developed through participation in a structured experience or intervention, such as a sequence of professional development workshops or a preparation program. These experiences may be designed for an aspiring teacher leader or someone currently serving in a teacher leader role. Such programs may be associated with a particular teacher leader position or designed to develop general teacher leader capabilities.

Teacher leader preparation programs are constructed of a variety of discrete components, each of which is intended to contribute to the development of teacher leadership. Research studies of programs to develop teacher leadership often report the effects of a preparation program without differentiating among the several discrete components of each program, such as the topics that were taught or the design of the program. Because the users of these research studies, such as developers of future teacher leader preparation program, are more likely to replicate a discrete component of a program than replicating a program in its entirety, this review focuses on studies that highlighted the effect of discrete components of preparation programs on teacher leadership. What is taught, how it is taught, and by whom, are examples of the discrete components of preparation programs that have been investigated through empirical study.

- **Twenty four studies examined the relationship between the content of a preparation program and teacher leader knowledge or practice.** In these studies, findings focus on changes in teacher leader knowledge of specific topics or the connection between the content of a preparation program and post-intervention teacher leader practice. For example, a study may measure the change in participants' knowledge of geometry, or the change in teacher leader practice after receiving training in facilitating workshops for teachers. Findings from these studies highlight the knowledge that teacher leaders are expected to have in order to lead.
- **Eight studies investigated the relationship between the design of the teacher leader preparation program and teacher leader knowledge or practice.** Preparation programs consist of a variety of learning experiences for participants, such as hands-on activities, lectures, or literature reviews. These studies examined the influence of specific design features of preparation programs on teacher leader knowledge or practice. Findings from these studies offer examples of specific structures that help develop the knowledge and skills for teacher leadership.
- **Five studies attended to the involvement of STEM faculty members in the preparation of teacher leaders.** The knowledge and skills of those who deliver and design preparation for teacher leadership may influence what participants learn. Five studies noted the involvement of STEM faculty in a teacher leader preparation program. These studies did not include findings specific to the role of STEM faculty involvement, but offer some perspective on how STEM faculty contribute to teacher leader preparation. These studies offer some perspective on the effect of STEM faculty involvement.

The relationship between the content of a preparation program and teacher leader knowledge or practice

Twenty five studies were identified that examined the relationship between the content of a preparation program and teacher leader knowledge or practice. These studies included findings on discrete components of the content of the preparation program. Information about these studies is displayed in Table 1. Information about the intervention is shown in Table 2.

The majority of these studies examined the relationship between the content of the preparation program and changes in teacher leader knowledge of that content[1]. The specific topics targeted in each program varied, with studies spanning across mathematics and science and grade levels, and based on different models (sometimes unspecified) of what teacher leaders do in schools and/or districts. While the specific content of the programs varied, content could generally be grouped into three categories: disciplinary knowledge (such as topics in mathematics or science), knowledge of leadership (such as adult learning or leading workshops), and knowledge of instruction (such as assessment strategies and standards). All of the studies reported a positive increase in teacher leader knowledge in the examined topics. The majority of these studies examined teacher leader preparation programs that included coverage of content from multiple categories. Nearly all of the programs addressed disciplinary knowledge, indicating that subject area knowledge was considered of primary importance for most teacher leader programs. These findings were consistent across studies of teacher leaders in mathematics and science, and across grade levels. This suggests that preparation programs to develop teacher leaders' knowledge may be effective in a variety of settings.

A smaller set of studies[2] examined the connection between participation in a preparation program and teacher leader practice. Findings from these studies suggest that a focus on a particular topic (such as a new curriculum) and type of teacher leader activity (such as supporting the implementation of instructional materials by classroom teachers) in a preparation program resulted in teacher leaders focusing on those topics and activities in their practice. Most of the studies in this set examined teacher leader practices around supporting the implementation of instructional materials by classroom teachers[3]. Two studies[4] investigated a broader range of teacher leadership practice with other teachers, such as providing resources, leading workshops, and working alongside teachers in their classrooms. Two studies found that participation in a preparation program influenced teacher leaders' classroom teaching[5]. As a result, while the findings from these studies

[1] Blasie & Bulter-Kahle, 2009; Copeland & Gray, 2002; Fortner & Boyd, 1995; Freeman et al., 1994; Hofstein et al, 2004; Johanson et al., 1996; Khourey-Bowers et al., 2005; Madsen et al., 1991; Madsen & Lanier, 1991; McGatha et al., 2005; Sack & Kamau, 2009; Oehrtman et al., 2009; Slater et al., 1998; Smith & Wickwire, 2009; Venville et al., 1998; Weaver & Dick, 2009; Whitsett & Riley, 2003; Whitenack et al., 2008

[2] Blank et al., 2006; Brown et al., 2001; Fortner & Boyd, 1995; Frechtling & Katzenmeyer, 2001; Kimble et al, 2006; Russell, 1990; Miller et al., 1999; Wallace et al., 1999

[3] Brown et al., 2001; Fortner & Boyd, 1995; Frechtling & Katzenmeyer, 2001; Russell, 1990

[4] Miller et al., 1999; Wallace et al., 1999

[5] Blank et al., 2006; Kimble et al., 2006

Table 1: Preparation Content and Teacher Leader Knowledge or Practice – Study Characteristics

		Data Types		Measures					Purpose	
Study	**Sample Size[6]**	**Qualitative**	**Quantitative**	**Interviews**	**Observations**	**Surveys/ Questionnaires**	**Coaching Logs**	**Other**	**Program Evaluation**	**Research**
Improving instruction through schoolwide professional development: Effects of the data-on-enacted-curriculum model (Blank et al., 2006)	439		•			•				
Teacher Leadership Project 2001: Evaluation report (Brown et al., 2001)	1000	•					•			
Developing Maryland's technology education leaders for the 21st century: Technology Education Leadership Project (TELP) (Copeland & Gray, 2002)	57		•			•			•	
Infusing earth systems concepts throughout the curriculum (Fortner & Boyd, 1995)	174	•				•			•	
Findings from the multi-agency study of teacher enhancement programs (Frechtling & Katzenmeyer, 2001)	NA[7]	•		•	•	•		•	•	
Evaluation of a summer science institute for elementary teachers (Freeman et al., 1994)	34	•	•			•			•	
The professional development of high school chemistry coordinators (Hofstein et al., 2004)	21	•	•			•			•	
The evaluation of the Lead Teacher Project (Johanson et al., 1996)	84		•			•			•	
Influence of a shared leadership model in creating a school culture of inquiry and collegiality (Khourey-Bowers et al., 2005)	54	•	•		•	•		•		•
Success of a professional-development model in assisting teachers to change their teaching to match the more emphasis conditions urged in the National Education Standards (Kimble et al., 2006)	8		•		•	•		•		•
A new professional role for junior high school science and mathematics teachers (Madsen et al., 1991) Improving mathematics instruction through the role of the support teacher (Madsen & Lanier, 1992)[8]	8	•		•	•	•		•		•
Becoming a leader in mathematics: A study of leaders' professional development experiences, awareness, beliefs, and attitudes (McGatha et al., 2005)	NA[9]	•	•			•				•
Pebbles in the ocean or fountains of change? New insights on professional development: Examining the links—Professional development, teacher leaders, and school change (Miller et al., 1999)	354	•		•	•		•			•

[6] For the purposes of this table, *Sample Size* refers to the number of teacher leaders involved in the study.

[7] The sample of teacher leaders was not specified; data were collected from 1597 science teachers participating in PD programs

[8] Madsen & Lanier (1992) is a report on a subset of the data contained in Madsen, Gallagher & Lanier (1991). For the purpose of this summary, these two pieces are reviewed as a single study.

[9] The sample of teacher leaders was not specified; data were collected from 37 participants that consisted of teachers, administrators and university faculty.

Table 1 Continued: Preparation Content and Teacher Leader Knowledge or Practice – Study Characteristics

		Data Types		Measures					Purpose	
Study	**Sample Size[10]**	**Qualitative**	**Quantitative**	**Interviews**	**Observations**	**Surveys/ Questionnaires**	**Coaching Logs**	**Other**	**Program Evaluation**	**Research**
Attributes of content-focused professional learning communities that lead to meaningful reflection and collaboration among math and science teachers (Oehrtman et al., 2009)	NA[11]	•	•			•		•		•
The dissemination of doing chemistry. Final evaluation (Russell, 1990)	206	•				•			•	
A telecommunications project to empower Kansas elementary/middle level teachers as change agents for integrated science and mathematics education (Slater et al., 1998)	24	•	•	•		•			•	
A state-wide change initiative: The Primary Science Teacher-Leader Project (Venville et al., 1998)	65	•		•		•				•
Six leadership models for professional development in science and mathematics (Wallace et al., 1999)	360	•		•	•		•	•		•
Oregon mathematics leadership institute project: Evaluation results on teacher content knowledge, implementation fidelity, and student achievement (Weaver & Dick, 2009)	~180		•			•		•	•	
Defining and applying leadership: Perceptions of teacher leader candidates (Whitsett & Riley, 2003)	18	•				•				•
Argumentation and the role of proof making in the preparation of K-5 mathematics specialists (Whitenack et al., 2008)	NA[12]	•			•					

[10] For the purposes of this table, *Sample Size* refers to the number of teacher leaders involved in the study.
[11] The sample of teacher leaders was not specified; data were collected from an unspecified number of participants representing schools in six school districts.
[12] Data were collected from an unspecified number of teacher leader participants.

Table 2: Preparation Content and Teacher Leader Knowledge or Practice – Intervention Characteristics

Study	Grade levels	Subject[13]				Intervention			Preparation feature investigated		
		Math	Science	Other	NA	Full description	Teacher leader involvement	Researcher(s) involved	Program content	Program design	STEM involvement
Improving instruction through schoolwide professional development: Effects of the data-on-enacted-curriculum model (Blank et al. , 2006)	6-8	•	•			Y	Y	N	•		
Teacher Leadership Project 2001: Evaluation report (Brown et al., 2001)	K-12				•	Y	?	N	•		
Developing Maryland's technology education leaders for the 21st century: Technology Education Leadership Project (TELP) (Copeland & Gray, 2002)	6-12			•		Y	Y	N	•		
Infusing earth systems concepts throughout the curriculum (Fortner & Boyd, 1995)	K-12		•			Y	?	Y	•	•	
Findings from the multi-agency study of teacher enhancement programs (Frechtling & Katzenmeyer, 2001)	K-12		•			N	?	N	•		
Evaluation of a summer science institute for elementary teachers (Freeman et al., 1994)	K-5		•			N	Y	?	•	•	
The professional development of high school chemistry coordinators (Hofstein et al., 2004)	8-12		•			Y	?	N		•	
The evaluation of the Lead Teacher Project (Johanson et al., 1996)	K-5	•	•			N	?	N	•		•
Influence of a shared leadership model in creating a school culture of inquiry and collegiality (Khourey-Bowers et al., 2005)	6-12		•			Y	Y	N			
Success of a professional-development model in assisting teachers to change their teaching to match the more emphasis conditions urged in the National Education Standards (Kimble et al., 2006)	6-10		•			Y	Y	N	•		
A new professional role for junior high school science and mathematics teachers (Madsen et al., 1991) Improving mathematics instruction through the role of the support teacher (Madsen & Lanier, 1992)[14]	6-8	•	•			Y	?	Y	•		
Becoming a leader in mathematics: A study of leaders' professional development experiences, awareness, beliefs, and attitudes (McGatha et al., 2005)	K-12	•				Y	Y	?	•		

[13] "Other" refers to other subject areas that were a focus of teacher leader work (e.g., literacy); "NA" refers to teacher leader work that did not have a subject-specific focus (e.g., engaging in whole school reform).

[14] Madsen & Lanier (1992) is a report on a subset of the data contained in Madsen, Gallagher & Lanier (1991). For the purpose of this summary, these two pieces are reviewed as a single study.

Table 2 Continued: Preparation Content and Teacher Leader Knowledge or Practice – Intervention Characteristics

Study	Grade levels	Subject[15]				Intervention			Preparation feature investigated		
		Math	Science	Other	NA	Full description	Teacher leader involvement	Researcher(s) involved	Program content	Program design	STEM involvement
Pebbles in the ocean or fountains of change? New insights on professional development: Examining the links—Professional development, teacher leaders, and school change (Miller et al., 1999)	K-5	•	•			N	?	Y	•		
Attributes of content-focused professional learning communities that lead to meaningful reflection and collaboration among math and science teachers (Oehrtman et al., 2009)	9-12	•	•			Y	?	?	•		•
The dissemination of doing chemistry. Final evaluation (Russell, 1990)	8-12		•			N	?	N	•		
A telecommunications project to empower Kansas elementary/middle level teachers as change agents for integrated science and mathematics education (Slater et al., 1998)	K-8	•	•			Y	Y	Y	•		
A state-wide change initiative: The Primary Science Teacher-Leader Project (Venville et al., 1998)	K-5		•			Y	?	?	•	•	
Six leadership models for professional development in science and mathematics (Wallace et al., 1999)	K-5	•	•			Y	?	Y	•		
Oregon mathematics leadership institute project: Evaluation results on teacher content knowledge, implementation fidelity, and student achievement (Weaver & Dick, 2009)	K-12	•				Y	?	Y	•		•
Defining and applying leadership: Perceptions of teacher leader candidates (Whitsett & Riley, 2003)	K-5, 9-12				•	N	Y	Y	•		

[15] "Other" refers to other subject areas that were a focus of teacher leader work (e.g., literacy); "NA" refers to teacher leader work that did not have a subject-specific focus (e.g., engaging in whole school reform).

consistently found that teacher leaders' practice mirrored their preparation, what constituted teacher leader practice varied.

The relationship between the design of the teacher leader preparation program and teacher leader knowledge or practice

Eight studies included findings on the relationship between specific learning activities in a teacher leader preparation program and changes in teacher leader knowledge or skills. Information about these studies is displayed in Table 3. Information about the intervention is shown in Table 4.

Findings in these studies highlighted specific activities and structures of the preparation program that were linked to what teacher leaders learned, such as: peer-led on-line discussions[16], interactive workshop activities[17], replicating published research studies[18], or access to other peers participating in the program[19]. Most studies found that a particular aspect of the learning experience had contributed to changes in teacher leader knowledge and skills. While there was little overlap among these eight studies in which structures were linked to increased teacher leader knowledge and skills, hands-on learning experiences (such as conducting experiments[20]) emerged as a feature that was associated with positive changes in teacher leader knowledge and skills.

The teacher leader preparation programs described in these studies were extensive, and suggest design characteristics for structuring preparation programs to develop teacher leadership. Descriptions in these studies indicated that preparation programs were extensive, generally occurring over a one or two- year period. Similarly, most programs were organized around a summer institute, typically lasting one or two weeks[21]. These studies were not designed, however, to investigate the effects of the extensiveness of the preparation programs on developing teacher leadership, indicating an area that warrants additional attention from researchers.

STEM faculty involvement in the preparation of teacher leaders

An important, although often implicit, premise in teacher leader preparation programs is that the knowledge and skills of those who develop and deliver such programs has an effect on participants' learning. Among NSF- funded Math/Science Partnerships, an articulated hypothesis is that participation of university faculty in the STEM disciplines (science, mathematics, engineering and technology) will impact teacher leader knowledge and skills. However, the relationship between the knowledge and skills of leaders of preparation programs for teacher leadership and what participants learned was largely absent in studies identified in our review of the empirical literature. Six studies included sufficient information about staff that develop and deliver preparation for teacher leaders; no studies were designed to investigate the effect of the knowledge and

[16] Lalli & Feger, 2005
[17] Fortner & Boyd, 1995; Khourey-Bowers et al, 2005; Nesbit et al., 2001
[18] Even, 1999
[19] Howe & Stubbs, 2003
[20] Even, 1999
[21] The exception was Lalli & Feger, 2005

Table 3: Preparation Design and Teacher Leader Knowledge or Practice – Study Characteristics

		Data Types		Measures					Purpose	
Study	**Sample Size[22]**	**Qualitative**	**Quantitative**	**Interviews**	**Observations**	**Surveys/ Questionnaires**	**Coaching Logs**	**Other**	**Program Evaluation**	**Research**
Integrating academic and practical knowledge in a teacher leaders' development program (Even, 1999)	30	•		•	•	•	•			•
Infusing earth systems concepts throughout the curriculum (Fortner & Boyd, 1995)	174	•				•			•	
Evaluation of a summer science institute for elementary teachers (Freeman et al., 1994)	34	•	•			•			•	
Developing leaders for tomorrow: releasing system potential (Harris & Townsend, 2007)	139	•		•		•		•	•	
From science teacher to teacher leader: Leadership development as meaning making in a community of practice (Howe & Stubbs, 2003)	3	•		•	•			•		•
Influence of a shared leadership model in creating a school culture of inquiry and collegiality (Khourey-Bowers et al., 2005)	54	•	•		•	•		•		•
Gauging and improving interactions in online seminars for mathematics coaches (Lalli & Feger, 2005)	57	•	•				•			•
In their own words: What science and mathematics teacher leaders say are important aspects of professional development (Nesbit et al., 2001)	288	•		•		•				•

[22] For the purposes of this table, *Sample Size* refers to the number of teacher leaders involved in the study.

Table 4: Preparation Design and Teacher Leader Knowledge or Practice – Intervention Characteristics

Study	Grade levels	Subject[23]				Intervention			Preparation feature investigated		
		Math	Science	Other	NA	Full description	Teacher leader involvement	Researcher(s) involved	Program content	Program design	STEM involvement
Integrating academic and practical knowledge in a teacher leaders' development program (Even, 1999)	6-12	•				Y	Y	Y		•	
Infusing earth systems concepts throughout the curriculum (Fortner & Boyd, 1995)	K-12		•			Y	?	N	•	•	
Evaluation of a summer science institute for elementary teachers (Freeman et al., 1994)	K-5		•			N	Y	?	•	•	
Developing leaders for tomorrow: releasing system potential (Harris & Townsend, 2007)	NA[24]					N	Y	Y		•	
From science teacher to teacher leader: Leadership development as meaning making in a community of practice (Howe & Stubbs, 2003)	K-12		•			N	Y	Y		•	•
Influence of a shared leadership model in creating a school culture of inquiry and collegiality (Khourey-Bowers et al., 2005)	6-12		•			Y	Y	N			
Gauging and improving interactions in online seminars for mathematics coaches (Lalli & Feger, 2005)	K-5	•				Y	Y	Y		•	
In their own words: What science and mathematics teacher leaders say are important aspects of professional development (Nesbit et al., 2001)	K-5	•	•			Y	Y	Y		•	

[23] "Other" refers to other subject areas that were a focus of teacher leader work (e.g., literacy); "NA" refers to teacher leader work that did not have a subject-specific focus (e.g., engaging in whole school reform).
[24] Grade level not specified.

skills of these staff on the development of teacher leadership. Information about these studies is displayed in Table 5. Information about the interventions is shown in Table 6.

These studies represented preparation programs for teachers in mathematics and science, and in grades K-12, indicating that STEM faculty may be viewed as contributors to teacher leadership across subject areas and grade ranges. All six studies indicated that the preparation programs had a positive impact on teacher leader knowledge and skills. Two studies reported that the inclusion of STEM faculty was beneficial to the goals of the preparation programs. Howe and Stubbs (2003) found that participants cited access to scientists as one of the features of the program that impacted their growth in teacher leadership capabilities. Whitenack et al. (2008) noted that the mathematician who led instruction in a course for teacher leaders was effective in facilitating class discussions on mathematic concepts. Clearly the involvement of STEM faculty in teacher leader preparation is an area where additional research is warranted. Future studies into teacher leader preparation programs should include descriptions of who is involved in leading preparation and examine linkages between professional development providers and increased teacher leader knowledge and skills.

Evidentiary base for claims about teacher leader preparation programs

Programs to develop the knowledge and skills of teacher leaders can be examined through the contributions of the discrete components of the program's content, structure, or who is involved in designing and delivering preparation. In the set of studies that included findings on these discrete components, there are some common methodological issues that should be taken into consideration when reviewing the findings described in this summary. A significant issue for these studies was the lack of reliable and valid measures of teacher leader knowledge or skills. Researchers often developed their own instruments specifically for the study, with little or no information about the reliability or validity of these measures. It is difficult, therefore, to aggregate findings across studies since it is not clear that the knowledge or skills were measured in the same way. This issue is particularly pertinent to studies that measured change in teacher leader knowledge, as it raises concerns about the validity of the findings that programs had a positive impact on the participants. A subset of these studies employed a pre-post intervention design for data collection[25]; most studies collected data after participation in the program had ended.

The majority of studies employed multiple data sources, though some relied on a single data source[26]. A limitation in many studies was the reliance on self-reported data from teacher leaders, typically through interviews or questionnaires. It was not usually clear from the description of analysis whether data triangulation was attempted or whether there was other verification of self-report data. Most of the studies did not have a research design adequate for generalizing beyond the contexts of a particular study. With some exceptions, studies did not use a comparison group against which to make claims of

[25] Copeland & Gray, 2002; Freeman et al., 1994; Hofstein et al., 2004; Khourey-Bowers et al., 2005; Kimble et al. 2006; McGatha et al., 2005; Nesbit et al., 2001; Russell, 1990; Slater et al., 1998; Weaver & Dick, 2009; Whitsett & Riley, 2003

[26] Relied on a single data source: Brown et al.., 2001; Forthner & Boyd, 1995; Hofstein et al., 2004

Table 5: Teacher Leader Preparation Involving STEM Faculty – Study Characteristics

		Data Types		Measures					Purpose	
Study	**Sample Size[27]**	**Qualitative**	**Quantitative**	**Interviews**	**Observations**	**Surveys/ Questionnaires**	**Coaching Logs**	**Other**	**Program Evaluation**	**Research**
From science teacher to teacher leader: Leadership development as meaning making in a community of practice (Howe & Stubbs, 2003)	3	•		•	•			•		•
The evaluation of the Lead Teacher Project (Johanson et al., 1996)	84		•			•			•	
Attributes of content-focused professional learning communities that lead to meaningful reflection and collaboration among math and science teachers (Oehrtman et al., 2009)	NA[28]	•	•			•		•		•
Oregon mathematics leadership institute project: Evaluation results on teacher content knowledge, implementation fidelity, and student achievement (Weaver & Dick, 2009)	~180		•			•		•	•	
Argumentation and the role of proof making in the preparation of K-5 mathematics specialists (Whitenack et al., 2008)	NA[29]	•			•			•		•

[27] For the purposes of this table, *Sample Size* refers to the number of teacher leaders involved in the study.
[28] The sample of teacher leaders was not specified; data were collected from an unspecified number of participants representing schools in six school districts.
[29] Data were collected from an unspecified number of teacher leader participants.

Table 6: Teacher Leader Preparation Involving STEM Faculty – Intervention Characteristics

Study	Grade levels	Subject[30]				Intervention			Preparation feature investigated		
		Math	Science	Other	NA	Full description	Teacher leader involvement	Researcher(s) involved	Program content	Program design	STEM involvement
From science teacher to teacher leader: Leadership development as meaning making in a community of practice (Howe & Stubbs, 2003)	K-12		•			N	Y	Y		•	•
The evaluation of the Lead Teacher Project (Johanson et al., 1996)	K-5	•	•			N	?	N	•		•
Attributes of content-focused professional learning communities that lead to meaningful reflection and collaboration among math and science teachers (Oehrtman et al., 2009)	9-12	•	•			Y	?	?	•		•
Oregon mathematics leadership institute project: Evaluation results on teacher content knowledge, implementation fidelity, and student achievement (Weaver & Dick, 2009)	K-12	•				Y	?	Y	•		•
Argumentation and the role of proof making in the preparation of K-5 mathematics specialists (Whitenack et al., 2008)	K-5	•				Y	Y	?	•		•

[30] "Other" refers to other subject areas that were a focus of teacher leader work (e.g., literacy); "NA" refers to teacher leader work that did not have a subject-specific focus (e.g., engaging in whole school reform).

impact or improvement in teacher leaders' knowledge or skills[31]. The sample identified for study was usually not described in much detail and it is not known how participants were identified and selected.

A small group of studies included findings on the effect of specific learning activities and change teacher leader knowledge of particular topics in pedagogy and disciplinary content areas[32]. These studies provide the clearest link between the design of the program and specific changes in teacher leader knowledge and skills. Findings from these studies suggested that teacher leader knowledge of pedagogy and disciplinary content is improved through a program that prominently features disciplinary content, through structures such as hands-on experiments. Further study is needed to explicitly test and confirm these findings, and to further investigate the effect of other discrete components of teacher leader preparation programs.

[31] Exceptions were Blank et al., 2006; Lalli & Feger, 2005; Johanson et al., 2001
[32] Freeman et al., 1994; Fortner & Boyd, 1995; Johanson et al., 2001; Khourey-Bowers et al., 2006

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