



## Teaching Guide

| Teaching Guide           |                                                                                                                                                                                                                                                                                                                                                   |        |          |           |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------|-----------|
| Identifying Data         |                                                                                                                                                                                                                                                                                                                                                   |        |          | 2019/20   |
| Subject (*)              | Research and Innovation in Mathematics Teaching                                                                                                                                                                                                                                                                                                   |        | Code     | 652513221 |
| Study programme          | Mestrado Universitario en Didácticas Específicas                                                                                                                                                                                                                                                                                                  |        |          |           |
| Descriptors              |                                                                                                                                                                                                                                                                                                                                                   |        |          |           |
| Cycle                    | Period                                                                                                                                                                                                                                                                                                                                            | Year   | Type     | Credits   |
| Official Master's Degree | 2nd four-month period                                                                                                                                                                                                                                                                                                                             | First  | Optional | 3         |
| Language                 | SpanishGalician                                                                                                                                                                                                                                                                                                                                   |        |          |           |
| Teaching method          | Face-to-face                                                                                                                                                                                                                                                                                                                                      |        |          |           |
| Prerequisites            |                                                                                                                                                                                                                                                                                                                                                   |        |          |           |
| Department               | Pedagogía e Didáctica                                                                                                                                                                                                                                                                                                                             |        |          |           |
| Coordinador              |                                                                                                                                                                                                                                                                                                                                                   | E-mail |          |           |
| Lecturers                |                                                                                                                                                                                                                                                                                                                                                   | E-mail |          |           |
| Web                      | http://www.educacion.udc.es/index.php?pagina=table&id_titulacion=700                                                                                                                                                                                                                                                                              |        |          |           |
| General description      | Esta materia forma parte da optatividade do mestrado, e o obxectivo principal da materia e coñecer e traballar as diferentes metodoloxías que predomiñan na investigación e na innovación da didáctica da matemática.<br>Está deseñada para traballar os diferentes contidos a través de diversas tarefas que se elaborarán e resolverán na aula. |        |          |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                                                                                                                    |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A1   | To know the theoretical basis of interdisciplinary work and identify its centre of interest in school and non-school contexts.                                                                                                                                 |
| A2   | To identify and critically analyse interdisciplinary proposals in the educational world.                                                                                                                                                                       |
| A3   | To design, justify and evaluate in a systematic manner interdisciplinary proposals in different educational contexts.                                                                                                                                          |
| A4   | To develop the linguistic competence in a foreign language oriented towards the teaching in specific subjects.                                                                                                                                                 |
| A5   | To acquire a methodological training to carry out educational research.                                                                                                                                                                                        |
| A6   | To establish the general descriptors which conform a research project: to select, to develop, to deal with and interpret data and present results according to the purpose of the research.                                                                    |
| A7   | - To be able to apply theoretical knowledge related to Specific Didactics, both in research as in innovation and evaluation.                                                                                                                                   |
| A8   | To be able to defend and argue in oral and written ways the completed investigation and/or innovation work, using audio-visual aids.                                                                                                                           |
| A9   | To test and evaluate disciplinary and interdisciplinary teaching projects in real educational contexts and to promote suggestions for improvement related to the obtained results.                                                                             |
| A10  | To know the theoretical basis which sustain research and innovation in the field of Specific Didactics.                                                                                                                                                        |
| A11  | To know and understand scientific language and use it correctly in different ways of expression and communication.                                                                                                                                             |
| A12  | To identify the main research and innovation lines and their evolution in the area of Specific Didactics.                                                                                                                                                      |
| A13  | To analyse and critically assess research work and innovation projects in specific disciplinary fields.                                                                                                                                                        |
| A14  | To know the different types of methodologies used in educational research considering its appropriateness for problem-solving.                                                                                                                                 |
| A15  | To identify quality and control criteria both in research and in the teaching practice, encouraging a critical, reflective and innovative spirit.                                                                                                              |
| A16  | To design, justify and evaluate research and innovation projects in the field of Specific Didactics.                                                                                                                                                           |
| A17  | To select, adapt and apply materials, resources and ICTs to improve the teaching and learning in different disciplinary fields.                                                                                                                                |
| A18  | To acknowledge the research and innovation applied to Educational Sciences as a lifelong tool for innovation, educational and social improvement.                                                                                                              |
| B1   | To have and understand general knowledge to establish foundations and /or opportunities to stand out in the development and implementation of ideas, mainly in an action- research context.                                                                    |
| B2   | To be able to apply the acquired foundations and their problem-solving capabilities in new multidisciplinary contexts related to the specific research areas.                                                                                                  |
| B3   | To be able to join contents and accept the challenge to formulate complex statements out of a limited or incomplete information, including reflections about social and ethic responsibilities related to the application of their own knowledge and opinions. |
| B4   | To be able to transfer and communicate their conclusions and opinions in a clear and straight manner both in a specialized and a non-specialized audience.                                                                                                     |
| B5   | To have the required learning abilities to continue in a life-long-learning and autonomous process.                                                                                                                                                            |



|     |                                                                                                                                         |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------|
| B6  | To be able to analyse and synthesize.                                                                                                   |
| B7  | To be able to adapt to new situations.                                                                                                  |
| B8  | To work with initiative and in an autonomous way.                                                                                       |
| B9  | To work in a collaborative way.                                                                                                         |
| B10 | To be able to organize and plan in curricular and cross-curricular subjects.                                                            |
| B11 | To be able to innovate (creativity) within educational and non-educational contexts.                                                    |
| B12 | to behave with ethics and with social and environmental responsibility as a teacher and/or researcher.                                  |
| B13 | To be able to communicate with their peers, educational community and with society in general in the field of their areas of knowledge. |
| B14 | To incorporate ICTs for the research process, information management, data analysis and for transferability.                            |
| B15 | To be able to update knowledge, methodologies and strategies in their teaching practices                                                |
| C1  | To express correctly, both orally and in written texts, in the two co-official languages of the Autonomous Community.                   |
| C2  | To express correctly, both orally and in written texts, in a foreign language (English).                                                |
| C3  | To use the main ICT's basic tools for their professional development and for their life-long-learning process.                          |
| C4  | To be able to self-develop for an open, critical, committed, democratic and solidary citizenship.                                       |
| C5  | To understand the importance of the entrepreneurship culture and the available means for entrepreneurs.                                 |
| C6  | To critically value available knowledge, technology and information to solve problems which students must face.                         |
| C7  | To assume as a professional and as a citizen the importance of life-long-learning.                                                      |
| C8  | To value the importance that research, innovation and technical developments have on society's socio-economical and cultural progress.  |

| Learning outcomes                                                                                                                               |                                                                  |                                                          |                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------|---------------------------------|
| Learning outcomes                                                                                                                               | Study programme competences                                      |                                                          |                                 |
| Aplicar os principios básicos da investigación sobre o traballo práctico na análise de procesos vinculados á mellora da competencia matemática. | AJ1<br>AJ3<br>AJ4<br>AJ6<br>AJ13<br>AJ14<br>AJ15<br>AJ16<br>AJ17 | BJ6<br>BJ7<br>BJ8<br>BJ9<br>BJ10<br>BJ11<br>BJ12<br>BJ14 | CJ1<br>CJ5<br>CJ7<br>CJ8        |
| Coñecer as principais metodoloxías, instrumentos e técnicas de investigación e innovación na didáctica da matemática.                           | AJ3<br>AJ7<br>AJ8<br>AJ9<br>AJ10<br>AJ11<br>AJ12<br>AJ15         | BJ2<br>BJ3<br>BJ4<br>BJ5<br>BJ6<br>BJ8<br>BJ9<br>BJ13    | CJ1<br>CJ2<br>CJ5<br>CJ6<br>CJ7 |
| Coñecer e analizar a importancia dos recursos didácticos para mellorar as actitudes cara a matemática.                                          | AJ11<br>AJ18                                                     | BJ6<br>BJ7<br>BJ8<br>BJ9<br>BJ10<br>BJ11<br>BJ12<br>BJ14 | CJ3<br>CJ4<br>CJ6<br>CJ7<br>CJ8 |



|                                                                                                                                                              |      |      |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| Planificar investigaciónes sobre problemas relacionados coa práctica, concretamente cos avances teóricos no campo de coñecemento da didáctica da matemática. | AJ2  | BJ1  | CJ3 |
|                                                                                                                                                              | AJ3  | BJ14 | CJ6 |
|                                                                                                                                                              | AJ5  | BJ15 | CJ8 |
|                                                                                                                                                              | AJ6  |      |     |
|                                                                                                                                                              | AJ12 |      |     |
|                                                                                                                                                              | AJ13 |      |     |
|                                                                                                                                                              | AJ17 |      |     |

| Contents                                                                                                        |                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Topic                                                                                                           | Sub-topic                                                                                                       |
| Procesos de adquisición do coñecemento en matemáticas.                                                          | Procesos de adquisición do coñecemento en matemáticas.                                                          |
| Deseño e traballo de metodoloxías, instrumentos, técnicas e recursos para o ensino-aprendizaxe das matemáticas. | Deseño e traballo de metodoloxías, instrumentos, técnicas e recursos para o ensino-aprendizaxe das matemáticas. |
| Principios básicos da innovación e investigación en educación matemática.                                       | Principios básicos da innovación e investigación en educación matemática.                                       |

| Planning                                                                                                                        |                                                      |                      |                               |             |
|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests                                                                                                           | Competencies                                         | Ordinary class hours | Student?s personal work hours | Total hours |
| Document analysis                                                                                                               | A2 A12 A15 B14 B15                                   | 0                    | 10                            | 10          |
| Collaborative learning                                                                                                          | A8 A9 A13 A17 B2 B3 B8 B9 B12 C7                     | 8.5                  | 8.5                           | 17          |
| Directed discussion                                                                                                             | A7 B1 B4 B5 B7 B12 B13 C1 C2 C4 C6 C8                | 10                   | 14                            | 24          |
| Research (Research project)                                                                                                     | A3 A4 A5 A6 A7 A16 A17 A18 B6 B8 B9 B10 B11 C3 C5 C8 | 0.5                  | 18.5                          | 19          |
| Oral presentation                                                                                                               | A8 B3 B4 B6 B7 B8 B9 B13 C1 C2                       | 0.5                  | 1.5                           | 2           |
| Introductory activities                                                                                                         | A1 A10 A11 A14                                       | 1.5                  | 0.5                           | 2           |
| Personalized attention                                                                                                          |                                                      | 1                    | 0                             | 1           |
| (*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students. |                                                      |                      |                               |             |

| Methodologies          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Document analysis      | Técnica metodolóxica que supón a utilización de documentos audiovisuais e/ou bibliográficos (fragmentos de reportaxes documentais ou películas, noticias de actualidade, paneis gráficos, fotografías, biografías, artigos, textos lexislativos, etc.) relevantes para a temática da materia con actividades especificamente deseñadas para a análise dos mesmos. Pódese empregar como introdución xeral a un tema, como instrumento de aplicación do estudo de casos, para a explicación de procesos que non se poden observar directamente, para a presentación de situacións complexas ou como síntese de contidos de carácter teórico ou práctico. |
| Collaborative learning | Conxunto de procedementos de ensino-aprendizaxe guiados de forma presencial e/ou apoiados con tecnoloxías da información e as comunicacións, que se basean na organización da clase en pequenos grupos nos que o alumnado traballa conxuntamente na resolución de tarefas asignadas polo profesorado para optimizar a súa propia aprendizaxe e a dos outros membros do grupo.                                                                                                                                                                                                                                                                          |
| Directed discussion    | Técnica de dinámica de grupos na que os membros dun grupo discuten de forma libre, informal e espontánea sobre un tema, aínda que poden estar coordinados por un moderador.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



|                             |                                                                                          |
|-----------------------------|------------------------------------------------------------------------------------------|
| Research (Research project) | Traballo extenso, realizado en grupo sobre un contido da materia.                        |
| Oral presentation           | Exposición na aula do Proxecto de investigación.                                         |
| Introductory activities     | Actividades de avaliación inicial para comprobar os coñecementos previos dos estudantes. |

| Personalized attention                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                                                                                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Oral presentation<br>Directed discussion<br>Collaborative learning<br>Introductory activities<br>Research (Research project) | <p>A atención personalizada descríbese en torno a estas metodoloxías como momentos de traballo presencial co profesor polo que se pide unha participación obrigatoria do estudante. A forma e o momento en que se traballen se indicará en relación a cada actividade ao longo do curso segundo o plan de traballo da materia.</p> <p>Aqueles estudantes con dispensa académica de exención de asistencia deberán comunicalo na primeira semán de clase e serán avaliados mediante un traballo (cunha ponderación do 50% na cualificación final) e unha proba individual (cunha ponderación do 50% na cualificación final), do mesmo xeito serán avaliados aqueles e aquelas que non cumpran un 80% de asistencia das sesións presenciais. A nota final será a media das cualificacións obtidas, solicitándose en cada unha delas para facer media unha nota igual ou superior a 5 puntos sobre 10 para superar a materia.</p> |

| Assessment                  |                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |
|-----------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Methodologies               | Competencies                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Qualification |
| Oral presentation           | A8 B3 B4 B6 B7 B8 B9 B13 C1 C2                       | Valorarase a claridade, a habilidade para presentar a información e a comunicación de resultados e conclusións.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 15            |
| Collaborative learning      | A8 A9 A13 A17 B2 B3 B8 B9 B12 C7                     | Valorarase as comunicacións e a intervención na aula como o traballo diario e recollido na aula.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 30            |
| Research (Research project) | A3 A4 A5 A6 A7 A16 A17 A18 B6 B8 B9 B10 B11 C3 C5 C8 | <p>Valorarase a metodoloxía, os resultados, a argumentación, as conclusións e a dificultade do tema elixido.</p> <p>Os contidos incluídos deben estar apropiadamente referenciados ao longo do traballo e no apartado de referencias usando as normas APA (6ª Edición ou posterior se procede). O texto literal debe declararse usando ditas normas. No parafraseado debe figurar as fontes orixinais das ideas que se reelaboran. A presenza de fontes científicas no traballo é un signo de credibilidade que é un requisito imprescindible para demostrar a excelencia académica.</p> <p>Recoméndase consultar:<br/> <a href="http://www.udc.es/biblioteca/servizos/apoio_investigacion/servizos_apoio/publicar/citar.html">http://www.udc.es/biblioteca/servizos/apoio_investigacion/servizos_apoio/publicar/citar.html</a></p> <p>Débese evitar o plaxio.</p> <p>As citas e as referencias a calquera texto debe declararse, o uso literal do texto ou ideas doutros autores parafraseadas sen declarar a fonte supón o suspenso do traballo en aplicación do artigo 14.4 da normativa académica de avaliacións, cualificacións e reclamación, aprobada polo Consello de Goberno do 19 de decembro de 2013 na que se indica que “na realización de traballos, o plaxio e a utilización de material non orixinal, incluído aquel obtido a través de internet, sen indicación expresa da súa procedencia e, se é o caso, o permiso do seu autor/a, poderá ser considerada causa de cualificación de suspenso na actividade”.</p> | 55            |

| Assessment comments |
|---------------------|
|---------------------|



A asistencia ás clases presenciais é obrigatoria.

Se o estudante non chega a unha asistencia do 80% das clases presenciais será avaliado:

- por unha proba individual (exame) que será un 50% da cualificación, e
- un traballo de investigación individual que será un 50% da cualificación final.

Tendo en conta que a cualificación mínima para que estas dúas partes compute na cualificación final sexa de 5.

## Sources of information

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Basic         | <ul style="list-style-type: none"><li>- Godino, J.D. (2013). Actividades de iniciación a la investigación en Educación Matemática.. Uno. Revista de Didáctica de la Matemática, 63, 69-76.</li><li>- Burghes, D. (Editor) (2012). Enhancing primary mathematics teaching and learning.. CfBT Education Trust. Plymouth, UK.</li><li>- Castro Martínez, E.; Olmo Romero, M<sup>a</sup> A.; Castro Martínez, E. (2002). Desarrollo del pensamiento matemático infantil. Departamento de Didáctica de la Matemática. Universidad de Granada, Granada.</li><li>- León Gómez, N.A. (2006). ¿Qué tan innovadores somos en Educación Matemática?. Números, 63, 49-57.</li><li>- Sivianes Valdecantos, S. (2009). El trabajo por proyectos y las matemáticas.. Números, 72, 75-80.</li><li>- Santos-Trigo, M. (2009). Innovación e investigación en Educación Matemática.. Innovación Educativa, vol.9, núm. 46, 5-13.</li><li>- Mato Vázquez, D.M. (2017). Aprender para enseñar matemáticas en Educación Infantil.. Madrid: Pearson Educación S.A.</li><li>- Mato Vázquez, M.D. (2014). La afectividad hacia las matemáticas.. Createspaces: United States.</li><li>Ball, D.L., Thames, M.H., Phelps, G. (2008). Content Knowledge for Teaching. What Makes it Special? Journal of Teacher Education, 59(5), pp. 389-407.</li><li>Baumert, J., Kunter, M., Blum, W., Brunner, M., Voss, T., Jordan, A., Klusmann, U., Krauss, S., Neubrand, M., Tsai, Y.M. (2010). Teacher's Mathematical Knowledge, Cognitive; Activation in the Classroom, and Student Progress. American Education Research Journal, 47(1), pp. 133-180.</li><li>Hill, H., Ball, D.L., Schilling, S. (2004). Developing Measures of Teachers' Mathematical Knowledge for Teaching. The Elementary School Journal, 105(1), pp. 11-30.</li><li>Lee, P. y Lee, N.H. (2009). Teaching Primary School Mathematics: A Resource Book, Singapore: Singapore Mathematics Education Series.</li><li>Pons Parra, R.M.; Serrano González-Tejero, J.M. (2011) La adquisición del conocimiento: una perspectiva cognitiva en el dominio de las matemáticas. Educatio Siglo XXI, vol. 29, núm. 2. Os estudantes teñen á súa disposición multitude de recursos que completan estas referencias na plataforma Moodle.</li></ul> |
| Complementary |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## Recommendations

### Subjects that it is recommended to have taken before

### Subjects that are recommended to be taken simultaneously

### Subjects that continue the syllabus

## Other comments

Recoméndase os envíos dos traballos telemáticamente e de non ser posible, non utilizar plásticos, elixir a impresión a dobre cara, empregar papel reciclado e evitar imprimir borradores.

Débese facer un uso sostible dos recursos e a prevención de impactos negativos sobre o medio natural.

Débese ter en conta a importancia dos principios éticos relacionados cos valores da sostenibilidade nos comportamentos persoais e profesionais



(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.