Construction and Application of an Online Child Portfolio Assessment System

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Abstract. Portfolio assessment is a comprehensive evaluation method for children's development, and effective evaluation is based on professional children's growth portfolios. The children's growth portfolio mainly includes paper, electronic, and online forms, each with its own pros and cons. The online portfolios can avoid defects of paper portfolios, with large capacity, diversified evaluation body, flexible and customized design, professional leading significance, more integration and commemorative features. We have designed and implemented the “Ning Xiner Growth Records” online portfolio, which has been tested in several kindergartens, and achieved remarkable results. With continuous innovation of information technologies, the online portfolio will have broader development and application prospects. It is suggested that governments at all levels allocate special funds to support kindergartens to carry out online portfolio evaluation, develop targeted information technology training for teachers, and increase professional training and guidance for teachers in order to use Portfolio assessment effectively.

1. Introduction

The earliest use of Portfolio assessment was the “Project Zero” conducted by the Harvard Graduate School of Education[1].

In this project, children evaluate their learning effects and abilities through portfolios. The emphasis is not on the quality of their final works, but on the development and understanding of learning, which can help children understand what they should pursue. The Portfolio, as a way of evaluating students' learning process and results in the project, has been attached great importance by educators all over the world. In the mid-20th century, it emerged from the evaluation reform and gradually spread from primary and secondary schools to kindergartens. Portfolio assessment, as a practical form of developmental evaluation concept, has been widely used in the world. Renée Forgette-Giroux and Marielle Simon defined Portfolio as “a cumulative and ongoing collection of entries that are selected and commented on by the student, the teacher and/or peers, to assess the student's progress in the development of a competency”[2]. Black, Harrison and et.al. pointed out that Portfolio assessment, on the one hand, helps students to develop their subjectivity, students become more active and initiative in learning by communicating their ideas with teachers, on the other hand, helps teachers to change their views on students and learn to listen to students[3].

In 2001, the Ministry of Education of China issued the “Outlines for the Guidance of Kindergarten Education” (hereinafter referred to as Outlines)[4]. The Outlines pointed out in the “Education
Evaluation” that “education evaluation is an important part of preschool education, which is also one of necessary means to understand the suitability and effectiveness of the education, carry out the adjustment and improvement, promote the development of each children, and improve the quality of education”. Besides, “all administrative personnel, teachers, children and their parents are participants of the kindergarten educational evaluation. In addition, the evaluation process shall be such a type of the process which involves the participation, mutual support and cooperation of each party, and it shall go with the accompany of the whole education process naturally”. Furthermore, it adopts “observation, conversation, analysis of works and other methods” comprehensively. Nothing is better than Portfolio assessment to achieve all these requirements which integrates a variety of forms. Therefore, the establishments of children's growth portfolios have become routines of many kindergartens in China since the 21st century.

Portfolio assessment refers to the evaluation method which collects and selects the children's works, and records the children's typical words, deeds and emotional expressions by the planned and purposeful way, and displays growths and development processes of children in a period of time so as to promote emotions, attitudes, abilities, knowledge, skills developments of children effectively based on educational objectives by adults. Undoubtedly, such a type of evaluation method needs to use portfolios. Generally speaking, the portfolio used for evaluation is an item collection system that reveals processes of children's developments over time and is also the “living container” with continuity. However, the capacity of this kind of “container” is limited, the information inside the “container” may not complete and other possible situations are bound to affect the objectivity and authenticity of evaluation results, which may also result in loss of scientific nature in the evaluation and leads to invalid evaluation results ultimately. Therefore, construction of portfolios has played a key role in the process of implementation of Portfolio assessment.

2. Existence forms of Portfolios
Since the birth of the Portfolio, its original form is paper. With the advancement of information technologies, portfolios exist in the form of not only electronic portfolios, but also online portfolios. The following is a detailed analysis of pros and cons of various forms of portfolios.

2.1. Paper portfolios
Paper portfolios are the initial forms of portfolios, which exist extensively within kindergartens. More specifically, the form of paper portfolios may be a manual ( an upgraded version of Contact Manual Between Parents and Kindergarten ), an accordion-style folder, a box or an album of paintings. In addition, the collected materials are mainly photographs, written records, charts, paintings and so on. Moreover, This form of portfolios is basically handmade by teachers, usually stored in the kindergarten classroom activity room. They can be shared and read by parents or children occasionally and will be sent back to each family at the end of a semester or a school year.

The advantage of paper portfolios is that all materials can maintain their own “original” states, which means that portfolios are completely authentic and can be accessed at any time. However, the shortcomings are also obvious: 1. The paper portfolios are basically manmade by teachers. Making portfolios occupies a lot of teachers' time and the workload is huge. Under the premise of ensuring quantity, teachers have no time to take account of the quality of portfolios. 2. The columns and frameworks of manuals limit the items, content, and quantity of materials collection, and lack of flexibility, so that materials with personalized characteristics cannot enter portfolios, and the collection amount is not sufficient. 3. The handwritten texts are difficult to modify and some teachers' handwritings are not beautiful, which may not only affect the overall aesthetic degrees of paper portfolios, but also affect professional figures of kindergarten teachers. 4. Paper portfolios are basically static photos and texts rather than dynamic audio-visual material, which cannot reflect the development path of children truly and fully; 5. Paper portfolios need a large storage space. However, kindergartens usually have no sufficient spaces for storing them forever, which cannot form a perfect management system of children's growth portfolios. 6. As paper portfolios are usually stored in kindergartens during
making, parents' participation in production and evaluation is not high enough. 7. Both the parents and children are not interested in the paper portfolios for theirs poor overall qualities both in the forms and the contents. Regardless of the form and content, the overall quality of paper portfolios is often not good.

2.2. Electronic portfolios
Considering the disadvantages of the children's paper growth portfolios, some kindergartens began to attempt to apply information technologies and software to produce electronic portfolios, such as Powerpoint, Pocomaker, iebook, etc. Generally speaking, electronic portfolios collect and organize materials in multimedia form, including audio, video, picture, text and so on. Moreover, such a form of portfolios can be stored in the computer, can be burned into CDs, and can also be copied to mobile hard disks or U disks.

Compared with paper portfolios, electronic portfolios have their own irreplaceable advantages: 1. The minimum storage space. 2. The convenience to backup. 3. The portability. 4. They can be stored for a long time. 5. Low cost. 6. Modifiable. 7. They can store audio and visual materials. 8. Perfect vision effect.

Electronic portfolios are generally in the stand-alone version, which means that they do not connected to the Internet. Therefore, in the process of production, teachers are still the main body, parents and children's participation is limited, and so electronic portfolios are not satisfactory in terms of timeliness and accessibility. At the same time, although the workload of teachers has been reduced to some extent, but teachers still need to make an electronic portfolio for each individual child, which can only be operated on computers. The amount of work for making electronic portfolios is still very large for teachers.

2.3. Online portfolios
With the popularity of Internet and hardware devices such as computers and smart phones, online portfolios have emerged. This kind of portfolio is usually developed for kindergartens by professional IT service companies, which cannot be produced by teachers via some software themselves. Besides, its operation is also carried out on the Internet instead of stand-alone computer software. Moreover, online portfolios can be described as an upgraded version of electronic portfolios, which can be used at any time and at any place in the Internet environment. Obviously, the well-designed and properly used online portfolios have the basic advantages and more powerful functions over electronic portfolios, which can completely avoid drawbacks of traditional portfolios and truly realize the significance of Portfolio assessment.

Chi-Cheng Chang, Chaoyun Liang, and Yi-Hui Chen, Chi-Cheng[5] explored the reliability and validity of online portfolio self-assessment, and their research samples were from 72 senior high school students enrolled in a computer application course. Their research results showed that online portfolio self-assessment can faithfully reflect learning achievements, i.e. it is a reliable and valid assessment method.

At present, online growth portfolios of children are still in the initial stage. Moreover, some related products appearing in the market, because of the lack of professionalism, are mainly based on the commemorative meaning, and do not have professional values of Portfolio assessment. In order to solve the most difficult problem of children's development evaluations in the curriculum evaluations, we cooperated with a professional information technology team and developed the children growth portfolios named “Ning Xiner Growth Records” in our project research. The portfolios have also been on trial at several experimental kindergartens, which was welcomed by children, parents, teachers and kindergarten administrators.

3. Design and application of the online portfolios
In order to implement the new Education Act of China [6], the Outlines and Guidelines for Learning and Development of Children Aged 3 to 6 Years Old [7] ( hereinafter referred to as Guidelines ), the “Ning Xiner Growth Records” online portfolio is designed according to the basic concept of “love and
trust” of the “Learning Story” which is one form of New Zealand national curriculum evaluation. The “learning story” was put forward by Margaret Carr, and is outlined in a number of publications [8-11]. Learning stories is both a method of evaluating children and a method of research. It is a structural observation and record done in a real situation. It provides a continuous pictures of the development of children and can be used to record and communicate the complexity of children's learning.

The “Ning Xiner Growth Records” highlights the atmosphere of “love and trust” in children's growth, and focuses on “the growth of such a cute child” (“Ning Xiner” means “such a cute child” in Chinese). The basic principles of the column design, naming and operation of the portfolios are positioned as concern and fully affirm the shining point of children, and stimulate their great potential of self-growth. Collectors (usually parents and teachers) are required to be more concerned with what children “can do”, and things that they are interested in, instead of what children “cannot do” and their shortcomings. The focus of evaluation is on merits and interests of children's learning and development rather than weaknesses; the second person pronouns or epistolary style are used in the text records to show the care of adults and the equal and harmonious relationship between adults and children.

Besides, we studied dozens of different types of children growth portfolios, family-kindergarten contact manuals and kindergarten graduation memento books during constructing columns and framework of the “Ning Xiner Growth Records” portfolio, and carried out the overall design in accordance with the professional, cooperative, incentive, interactive, and monumental principles. In general, the ultimate objective of the “Ning Xiner Growth Records” construction is to use the Internet as a platform for parents and teachers to jointly record and evaluate development processes of children, and enhance the family-kindergarten interactions and equal dialogues, so as to achieve the in-depth cooperation and establishments of good environments for the healthy growths of children.

3.1. Basic framework and contents

The “Ning Xiner Growth Records” portfolio consists of four parts: a front cover, a catalog, inner pages and a back cover. In particular, the inner pages are designed with 16-20 columns according to the age characteristics of the toddler class, junior class, middle class and senior class. Besides, the same column has different names in the portfolio of different classes, and the content and operation requirements are adjusted accordingly. The design makes the entire portfolio both systematic and complete, and highlights the different requirements and characteristics of different age groups.

The content design of the portfolio can be summarized into 8 modules: Basic information, Kindergarten activities, Family activities, Children's works, Children's words, Memorial columns, Growth reports and Reviews, which combined with graphics and text, interspersed with audio and video. More specifically, the “Basic information” includes children, families, kindergartens and classes information. The “Kindergarten activities” includes the typical parts of the one-day activities, function rooms and regional activities, large-scale activities and theme activities. The “Family activities” includes the daily activities, none-routine activities, outdoor activities and other different types of activities which deserve to be recorded in the family. The “Children's words” includes various representative pictures, videos and sound recordings created by children in the kindergartens, families and communities, which include paintings, handmade works, construction works, self-compiled songs, dances, stories, games and so on. The “children's words” are interesting and memorable speeches and deeds that reflect children's thinking and cognitive characteristics. They can be written records or recorded audios or video clips by adults. The “Memorial columns” includes the birthday activities, graduation activities, friends souvenirs and so on. The “Growth reports” is a 11-page fuzzy rating evaluation form designed according to targets of the Guidelines, and combined with educational recommendations from the Guidelines. The “Growth reports” is also equipped with about 69,000-word of online assessment guidance, and is proposed for teachers and parents for each specific goal so as to make daily observations and evaluations of both teachers and parents in the kindergartens and homes to become more operational. The “Reviews” not only includes the overall evaluation and message of parents, teachers, friends and relatives writing or recording on the birthday of the child or at the end of the school year, but also includes the anecdotal records of teachers and parents in the form of learning
stories and educational stories. Figure 1 shows the catalog page of the senior class in the “Ning Xiner Growth Records” portfolio.

![Figure 1. The catalog page of the senior class](image)

The “Ning Xiner Growth Records” portfolio interface pages are written in Chinese, and the English words in Figure 1 is the translation of Chinese words nearby.

### 3.2. The portfolio creation and use

The “Ning Xiner Growth Records” portfolios run on the “NingXin Preschool Education Net” [12]. Parents or teachers can carry out the routine operations after logging in the website according to pre-assigned roles. Guangzhou Ningxin Information Technology Co., Ltd. is responsible for leasing servers and network spaces, maintaining software systems, and guiding parents and teachers to use the system in a correct manner. Moreover, the growth portfolios provide a detailed column operating guidelines for parents and teachers at the appropriate location of each page and explain the collection and editing methods of each column information. Figure 2 is the parent’s message column page of the senior class. The 5 boxes in the middle are used to store parents’ input of text, audio, or uploaded pictures and videos, and the upper right corner is the popped operating guidelines.

![Figure 2. The parent’s message column page of the senior class](image)
The rich contents of the growth portfolios come from the activity records of children both in kindergartens and at homes. Therefore, the archival materials are provided by parents and teachers at any time throughout a whole school year. In the meantime, the system has also developed smart phone APP (Android version and iOS version) at the same time, which enables both teachers and parents to use them to take pictures or videos, upload, access and input comments anytime, anywhere. Figure 3 is the three screenshots on the APP.

Figure 3. The three screenshots on the APP

Teachers are responsible for editing a few columns. The main editorial work of the whole portfolio is undertaken by parents. It will take a small amount of time each week for teachers to concentrate on the children's portfolios. At a fixed time every weekend, parents may discuss with their children, choose which materials to add to the portfolio, and edit relevant pages at home. This can also help to develop good parent-child relationships. Furthermore, children's growth reports and birthday souvenirs require parents and teachers to carry out observations, evaluations and reports in the week of children's birthday.

At the end of each school year, the whole growth portfolios can be downloaded and saved by parents and kindergartens. Besides, the growth portfolios are downloaded in PPT files form, which can be more delight to watch accompanying with background music chosen by parents and children if necessary. In addition, families can decide whether to print and bind the portfolio into a beautiful album according to actual situation. kindergartens can store the electronic portfolios of all children according to the grades and classes easily.

Teachers should read every portfolio at regular interval to get a thorough understanding of each child and his family's understanding, expectations and evaluation of him, compare the performance of children in kindergartens, make a professional analysis of each child, and conduct a comprehensive self-evaluation of the effectiveness of this class on the basis of portfolios, so as to formulate the more targeted teaching and caring activities work plans of the next stage and promote the case education. Furthermore, teachers should also have professional sensitivity, catch the information passed on by parents in time, communicate with parents at any time and on their own initiative when necessary, and provide professional support for the healthy and harmonious development of children.

Parents should check the materials uploaded by teachers at any time, keep abreast of the activities of children in the kindergarten and class, evaluate the development status of children objectively, and cooperate with teachers actively to complete the work plan for education. Once a week, parents should insist on editing portfolios, review and exchange with children. These can promote parent-child relationship and cultivate children's multiple abilities.
4. Characteristics and values of the portfolios

The “Ning Xiner Growth Records” portfolio has been tested in several kindergartens in Guangzhou, China for two school years. It has been well welcomed by teachers and parents. Its characteristics and values are mainly reflected in the following four aspects.

1) **Large capacity and comprehensive information**: The design of the unlimited number of pages in the online portfolio enables the portfolio to display unlimited capacity, to store all kinds of documents adequately, and to meet needs of large capacity archives for both qualitative and quantitative evaluation. The degree of parental involvement has been significantly increased, and the number of archives of children's family activities and kindergarten activities in the complete set of portfolios is basically the same, which can objectively and comprehensively reflect the true state of children, and provide sufficient information for accurately evaluating the development of children.

2) **Diversification of evaluation subjects**: The wide use of the Internet and smart phones enables the construction of online portfolios to be carried out anytime and anywhere, the immediacy and accessibility of portfolios can be realized, and parents become main collaborators and finishers of portfolio production. At the same time, the family participates in the process of selection, description, evaluation and editing of archival materials in the form of parent-child activities. The children are truly transformed from the object of evaluation to one of the evaluation subjects.

3) **Flexible and customized portfolio design**: The application of mature information technology makes the portfolio is no longer the same for all kindergartens, but can be customized according to requirements of kindergartens with distinctive layout and content, to meet customization of different kindergartens and brand building requirements.

4) **Professional leading significance**: In the process of guiding parents to fill the archives and correctly use the portfolio, the kindergarten promotes parents to study in depth and implement the Guidelines to help parents establish correct parenting concepts and master scientific family education methods. In turn, it will achieve mutual education and achieve deep cooperation between families and kindergartens. Through the construction of online portfolios, kindergartens can also form research projects to improve professional competence of teachers and modern management level of kindergartens, such as observation and evaluation of the status of early childhood development, parents and kindergarten cooperation based on network platform, etc.

5. Conclusion

In the future, we will continue to improve the “Ning Xiner Growth Records” portfolio, such as introducing AI technologies to automatically generate evaluation reports, recording the evaluation history of children on various evaluation indicators, predicting the development trend of children, and reminding parents and teachers to take targeted measures early.

In short, the advantages of the online portfolio are obvious, and has broader development and application prospects. We believe that it is necessary to give full play to the role of the online portfolio in kindergartens, the following issues need to be further concerned. For example, kindergartens with special funds for informatization construction should be included in their allocation category to support their informatization construction independently. Professional teams should be encouraged, supported and subsidized to develop information products needed by kindergartens, reduce their product prices and improve their service quality. The education departments shall carry out targeted professional training and guidance on information technology training and Portfolio assessment, improve the information literacy of teachers and the practical operation ability of the use of Portfolio assessment.

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